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The TEAM Study measured exposures to 20-25 volatile organic compounds in the air, drinking water, and exhaled breath of 650 persons in 4 states. Volume I is a summary and overview of the entire study. Volume II deals with studies in New Jersey, North Carolina, and North Dakota. Volume III deals with studies in California. Volume IV presents the Standard Operations Procedures employed in the study.

Major findings include: 1) personal monitors and breath spirometers employing Tenax adsorbents are sensitive and adequately precise instruments to determine normal daily exposures of the general public; 2) personal and indoor exposures generally exceeded outdoor concentrations; 3) major sources of exposure include occupations, smoking, visiting dry cleaners, and filling gas tanks.

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VOLUME III

FINAL REPORT

PART I

by

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SECTION 1

INTRODUCTION

Our attention has previously focused on the conduct of personal exposure studies along the Eastern part of the United States. In the process of performing these studies the Total Exposure Assessment Methodology (TEAM) program had undergone significant evolution from its inception (Phase I) through Phase II. The results of Phase II (see Vol. I) included a set of recommendations for consideration when implementing another field personal exposure study.

The opportunity arrived to conduct another field study and the West Coast was selected because it potentially offered different environmental challenges to our TEAM program and a complimentary set of personal exposure data to our Eastern study. The West Coast TEAM Study was performed in two specific areas. One area constituted several communities in Southern California, specifically, El Segundo, Manhattan Beach, Redondo Beach, Torrance, Hermosa Beach, Carson, Lomita, and Dominquez. This area was chosen for its industrial activity, photochemical smog, and deep well (containing brominated chemicals) and surface water supplies (depending on seasons).

The second area was in Northern California, specifically in Anitoch, and Pittsburg. The presence of industrial activity, the unique bay area meterological conditions and the conduct of an epidemiological study by the National Cancer Institute attracted our interests to this area.

This report describes a personal exposure study conceptually similar to the Eastern TEAM Study in that personal air, fixed-site air, drinking water and breath were examined from a probability based sample of individuals in these two areas. In Southern California, 117 individuals participated in personal exposure monitoring during the Winter season and a subsample of 52 individuals from the original group participated again during the early Summer season of 1984. In Northern California 71 people provided personal monitoring information during the summer of 1984. Finally, a complete set of standard operating procedures (47) for all aspects of the chemical sampling and analysis was prepared in support of the West Coast TEAM Study.

SECTION 2

RECOMMENDATIONS

STATISTICAL SAMPLE DESIGN

The statistical sample design employed for the Phase III TEAM studies was basically sound. The primary purpose of the TEAM studies was to estimate the distributions of personal exposure to certain organic compounds via air. Since these distributions were expected to have heavy right tails, the statistical samples were designed to overrepresent the individuals whose potential for high exposure appeared to be greatest. This also enabled more precise estimation of upper percentiles of the exposure distributions.

The Phase III TEAM sample design, with certain refinements, is recommended for future studies similar to TEAM that monitor personal exposure and body burden. Modifications of the design would be necessary for future studies that have different target chemicals and/or different study objectives. The Phase III TEAM sample design could be refined, based upon analysis of the Phase I and Phase II TEAM data, to developing more efficient stratification variables. However, it would still be desirable to keep the household screening instrument short to facilitate high response rates at the household screening stage of sample selection.

Another refinement of the TEAM survey methodology would be to sample person-days rather than to sample people. If the purpose of a study is to monitor the average daily personal exposures of people performing their usual activities, person-day sampling may be necessary whenever an individual's exposure is highly dependent upon the day on which the person is monitored. In studies of this type, bias could be introduced if sample subjects were allowed complete freedom of choice in selecting a day to be monitored. For example, many subjects might choose to be monitored on days when they expect to be inactive or staying at home. Ideally, a specific day should be randomly selected for each individual to be monitored. Such a procedure may be, of course, impractical; the response rate would be affected very adversely. Methodology for person-day sampling was tested in the EPA's CO personal exposure monitoring study.[1] Further methodology development is recommended for future studies that seek information utilizing person-day sampling.

The household screening data for the Phase III TEAM studies were manually edited by the sampling staff to ensure that all individuals suspected of having a potential for exposure were identified as such for stratification. Such manual editing of screening data is likely to be needed in future TEAM studies that use occupation as a basis for oversampling. However, if the population subgroups to be oversampled can be prespecified (e.g., double the sample selection probabilities for individuals in homes with gas stoves), then the selection of individuals could be done in the field concurrently with household screening. This would eliminate the need to recontact the households to identify the sample subjects and would almost surely increase response rates.

The database that resulted from Phase II and Phase III TEAM samples could also be used to derive on optimum sample survey design for comparable monitoring studies. For example, sample sizes for the household screening and exposure monitoring which minimize survey costs with respect to specific precision constraints (e.g., specified precision for upper percentiles of exposure distributions) could be derived. The optimal sample size allocation with respect to suspected exposure strata could also be derived. Regardless of such optimal allocations the expected precision estimates for important population parameters should be examined for alternative sample survey designs before finalizing the design of a future study.

SURVEY OPERATIONS

Two procedural changes might assist survey staff directly during the performance of the study. First the samples were clustered. Use of compact clustering of sample homes would create greater efficiency in all field activities. This would impact positively on chemical sampling also. Second, the necessity for an optimal size of incentives paid to respondents should be reviewed. Incentives cannot be eliminated without an effect on response rate, even though this would give considerable savings. Conversely, an increase in incentive might result in an increased response rate and, therefore allow a reduction in size of the previous sample stages.

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[1] Whitmore, R. W., Jones, S. M., and Rozenzweig, M. S. (1983). Final Sampling Report for the Study of Personal CO Exposure, Report No. RTI/2390/02-01F, Research Triangle Institute, Research Triangle Park, NC 27709.

STATISTICAL ANALYSIS

Although there has been extensive analysis of the California data, considerable additional analysis could be undertaken, including:

1. The questionnaire data collected from each participant has not been fully explored. This includes not only the household questionnaire but also the 24-hour exposure screener which the participants completed for activities during the 24-hour monitoring period. In particular stepwise regression analysis of questionnaire variables selected to predict breath and air volatile organic levels could be performed. After selection of significant variables, analysis of variance and detailed investigation of the resultant means could be done. Also, a detailed evaluation of the relationship between various questionnaire variables and observed levels of target compounds in indoor air remains to be done. Such an evaluation would assess whether differences in VOC levels in indoor air vs. outdoor air could be explained by the questionnaire data.
2. The weighted percents of concentrations measurable and summary statistics for averaged daytime and nighttime VOC concentration samples in air should be calculated (i.e., only statistics for 12-hour air exposures have been computed).
3. The relationships between compounds in a given medium should be examined. In particular, Spearman correlations between compounds and principal components analysis could be done. Principal components analysis would indicate whether a few linear combinations of compounds within a medium account for the observed variability in VOC concentrations.
4. Volatile organic compound levels in air, breath, and water samples collected at the various sampling sites should be compared. That is, comparisons of VOC levels in Los Angeles County, CA; Contra Costa County, CA; Bayonne and Elizabeth, NJ; Devils Lake, ND; and Greensboro, NC have not been reported. These analyses are difficult to interpret

due to seasonal differences between sample sites but are certainly worth investigating. This type of analysis could be very useful in comparing TEAM locations by taking into account the VOC levels for all compounds simultaneously rather than analyses done on single compounds.

5. Detailed multivariate analysis of the TEAM data base has not been undertaken. In particular, multivariate analysis to organize the VOCs into groups should be done (using principal components analysis) followed by an examination of the success of prediction of the VOC group concentrations by the questionnaire data. This type of analysis would be extremely useful in planning future surveys. In addition, the multivariate analysis of variance could be used to determine if VOC levels are significantly different by site and season.
6. The effects of meteorological conditions on indoor and outdoor VOC levels should be investigated. For example, the effects of wind direction and temperature on indoor levels of various compounds might be contrasted with the effects of these meteorological variables on the outdoor fixed-site VOC levels.
7. Detailed analysis of the blank and control samples collected during the study should be done. This involves using multivariate analysis techniques to determine when measured levels of volatile organic compounds are outliers compared with the fortified VOC levels.

QUALITY ASSURANCE

The following recommendations are proposed for similar work in the future.

1. Institute a formal training program for the sample collection staff. Although the on-the-job training approach was generally adequate, it would be preferable to present a complete explanation of the field operation to the staff and require them to demonstrate a command of the sampling techniques before they leave for the site. A similar orientation for these chemists involved in actual sample analysis is probably not as important since their duties are carried out on-site at the laboratory. However, there are advantages to having the staff demonstrate that they clearly understand and can competently perform their respective project assignments.

2. Develop a computerized sample tracking system. Samples would be logged in when collected at the site and appropriate entries made at other crucial stages; e.g., receipt at RTI, storage, analysis, data processing, data entry, and data review. Ideally, programming would be available to generate appropriate status summaries at any time during the study.
3. Procedures should be developed which would show a linkage between sample analytical results and specific QA/QC data. The system would allow individual results to be expressed in terms of a confidence interval or assigned an overall code which would indicate the level of data quality achieved for a particular sample or group of samples.
4. The QA officer should know the amount of target compound present in performance audit samples. Having this information, it would be possible to state at the time of analysis that the analytical performance was satisfactory or that some other factor was adversely affecting accuracy. In the latter case, appropriate corrective measures could be instituted before committing the system to sample analysis.

SECTION 3

SUMMARY AND CONCLUSIONS

STATISTICAL SAMPLE DESIGN

The primary purpose of the TEAM sample design was to stratify the sample of people selected for personal exposure and body-burden monitoring so as to overrepresent the rare subpopulation of individuals with unusually high exposure levels. This stratification was accomplished primarily by oversampling those individuals suspected of having high occupational exposure. This stratification was successful; the analyses in Section VIII show that most people with high exposure levels were occupationally exposed. Successful overrepresentation of the rare subpopulation of individuals with unusually high exposure levels increased the precision with which upper percentiles of the distributions of exposure and body-burden could be estimated (see Section VIII).

Although stratification by occupation successfully overrepresented individuals with unusually high exposure levels in the Phase III TEAM studies, analysis of the Phase II and Phase III TEAM data should be used to develop more efficient stratification variables for future studies that monitor personal exposure to organic compounds. Otherwise, the statistical sample design of the Phase III TEAM samples could serve as a prototype for future monitoring studies. The sample survey designs were completely nested within the stage units, which facilitates valid estimation of sampling variances. Noncompact clusters of sample housing units were selected with equal probabilities, which eliminates loss of precision due to unequal weighting and minimizes the decrease in precision due to intracluster correlation. The method of allocation of the Antioch/Pittsburg sample of people selected for monitoring resulted in identically equal initial sampling weights within the person-level sample selection strata. Hence, there are only two initial Antioch/Pittsburg person-level sampling weights - one for each of the suspected occupational exposure strata. Moreover, the only loss in precision due to unequal weighting is that which results from the difference in sample selection probabilities for the two strata. When this methodology is applied in future monitoring studies, the optimum household-level and person-level sample sizes that minimize survey costs, while achieving specific precision constraints, should be derived.

The response rates for the Phase III TEAM samples are summarized in Tables 1 and 2. In Southern California 117 and 52 persons participated in the winter and summer seasons personal monitoring, respectively, while 71 persons participated in Northern California exposure monitoring study in the summer of 1984. Table 1 displays the response rates specific to the individual sample stages, e.g., personal exposure and body-burden data were collected from 68.4 percent of the eligible individuals selected for the Los Angeles second season sample. The overall response rates (obtained as products of the response rates in Table 1) are displayed for each sampling stage in Table 2, e.g., 38.4 percent of the eligible members of the target population were represented by the Los Angeles second season participants. The overall response rates are rather low, especially for the second season sample. Low response rates are anticipated in studies that monitor personal exposure and body-burden because of their unusually high respondent burden. Nonresponse results in bias to the extent that exposure levels are related to willingness to participate. Hence, the nonresponse bias due to a given response rate may not be as severe for a monitoring study as it would be for an investigation of personal opinions and attitudes. Moreover, nonresponse weight adjustments reduce the potential bias to the extent that respondents and nonrespondents are more alike within weight adjustment clsses than in the overall target population.

SURVEY OPERATIONS

As reported previously, this study has demonstrated that it is possible to conduct a survey using a stratified random sample of the population in an area of interest. Using standard survey research techniques, a multistage process was followed. The selection of sampling units was followed by household screening in an attempt to identify individuals with the characteristics of interst, including routes of potential exposure. After the screening was completed, a sample was selected to be contacted and recruited for the study. While the potential burden of the sampling (amount of time involved and inconvenience of the sampling equipment) caused a lower response rate than is normally seen in

TABLE 1. SUMMARY OF RESPONSE RATES SPECIFIC TO SAMPLE STAGES

Study Area	Household Screening	First Season	Second Season
Los Angeles	87.2%	64.3%	68.4%
Antioch/Pittsburg	89.5%	64.0%	NA

TABLE 2. SUMMARY OF OVERALL RESPONSE RATES BY SAMPLE STAGES

Study Area	Household Screening	First Season	Second Season
Los Angeles	87.2%	56.1%	38.4%
Antioch/Pittsburg	89.5%	57.3%	NA

questionnaire-only data collection, it was still demonstrated that standard survey techniques could be utilized in the conduct of this type of study involving environmental and biological sampling.

CHEMICAL SAMPLING AND ANALYSIS

Drinking water, breath, personal air and fixed-site air samples were collected during two seasons in Los Angeles county, CA and one season in Contra Costa county, CA. Each study participant provided two personal air, two water and one breath sample over a twenty-four hour period. Fixed-site air samples were collected from each primary sampling unit. Data quality was assessed through the use of field controls and blanks and through the collection of duplicate samples.

As in Phase II of this program, selected volatile organic compounds were isolated from ambient air by pumping the sample through a cartridge packed with Tenax GC. Breath samples were collected in Tedlar bags using a custom-designed spirometer. Subsequently, the sample was pumped through Tenax GC cartridges to concentrate the analytes. Tenax GC cartridges were analyzed by capillary GC/MS/COMP. Water samples were collected from each participant's primary drinking water source in 2 oz. bottles and analyzed by purge and trap GC/HECD. In total, 241 participants were sampled, yielding 1388 Tenax GC samples and 697 water samples for subsequent analysis.

Prior to any project activities relating to sample collection or analysis in Phase III, Standard Operating Procedures (SOPs) were drafted and subjected to rigorous review. These documents were derived from the extensive experience in sampling and analysis gained during previous phases of the study and were intended to provide rigid and uniform guidelines for the sample collection and analysis processes.

Method detection limits for target compounds collected on Tenax GC were determined by replicate analysis of cartridges loaded with the target compounds at five times the historical instrumental limit of detection.

QUALITY ASSURANCE

A quality control/quality assurance (QC/QA) program was carried out during Phase III of the TEAM study. The results of these procedures will be presented and will address the following subject areas: (1) sample and data collection during field operations, (2) monitoring chemical analysis, (3) determination of analyte recovery and contamination (background) based on the analysis of field control and blank samples, (4) precision estimates based on duplicate sample analysis, and (5) accuracy assessment based on target compound measurement in performance audit samples. This information was evaluated and summary statements are presented on (1) field operations, (2) completeness, (3) precision, and (4) accuracy for each sampling trip to California. The first trip consisted of sample and data collection in the greater Los Angeles area, and the second trip involved a repeat visit to Los Angeles and a sample/ data collection in Contra Costa county.

Field Operations

The sample and data collection activities at the study sites proceeded without serious problems. Standard operating procedures were developed and utilized during this sampling. Another factor which was responsible for the relatively smooth collection operations was the increased experience of all the analytical field sampling staff.

Completeness

Completeness was defined as the percent of samples originally scheduled for collection for which analytical results were reported (either not detected, trace, or measurable). The completeness of field samples from all sampling trips was greater than 90%. The comparable completeness figure for D- and Q-type duplicates was greater than 80%.

Precision

Precision estimates were based on the analytical results for duplicate sample pairs, although the observed variability included contributions from both the collection and analysis. The agreement between duplicate concentration values for target compounds was expressed as a percent relative standard deviation (%RSD). These data were evaluated and compared with respect to sample matrix and target compound.

In general, the agreement between duplicate sample pairs was excellent. For most target compounds on Tenax, the median %RSD was less than 25 to 30% and the 75 percentile %RSD, less than 50 to 55%. Air and breath samples from the first Los Angeles sampling trip showed poorest precision for o-dichlorobenzene, n-undecane, and chlorobenzene. Duplicate samples from the second Los Angeles trip, which also included Contra Costa county, exhibited poorest precision for styrene, trichloroethylene, and benzene.

The agreement found between water duplicates was better than the Tenax results. For most target compounds, the median %RSDs were less than 10%.

Accuracy

Two criteria were used in assessing method accuracy: (1) the blank-corrected recovery of target compounds from field control samples and (2) results of performance audit samples.

In general, the field control samples associated personal air samples collected on the first trip to Los Angeles gave recoveries of 80 to 120%. However, 5 targets did exhibit excessively high recoveries (130-150%). With the exception of trichloroethylene and benzene, the performance audit sample results indicated an analytical bias of less than 25%. The target compounds on Tenax field controls from the second LA trip were characterized by low recoveries. This observation was particularly true for the breath and fixed-site air controls; personal air controls gave satisfactory recoveries. The Contra Costa field controls exhibited better target recoveries although the control cartridges for fixed-site air collected did indicate ten target compounds with excessively high recoveries (130-160%). The performance audit samples analyzed at this time gave average target recoveries of 80-85%.

In general, the water field control and performance audit data indicate target recoveries between 30 and 75%. Only the second trip performance audit results gave recoveries in the 80 to 130% range.

STATISTICAL ANALYSIS

Introduction

During the first half of 1984, exposure and body burden data were collected from a probability sample of individuals on twenty-six volatile organic compounds (see Tables 3 and 4 for a list of compounds) in Los Angeles and Contra Costa County. Two visits were made to Los Angeles while one was made to Contra Costa. The first visit to Los Angeles in February and March collected breath, overnight personal air, daytime personal air, overnight fixed site outdoor air, daytime fixed site outdoor air, and water samples on 117 people. The second visit to Los Angeles in May and June monitored the same media for

TABLE 3. TARGET COMPOUNDS SORTED BY WEIGHTED PERCENT MEASURABLE IN BREATH AND AIR SAMPLES BY SITE AND SEASON

	Range of % Measurable[a]		
	Los Angeles		Contra Costa
	Winter	Summer	Summer
Ubiquitous Compound			
m,*p*-Xylene	100	100	84-100
1,1,1-Trichloroethane	99-100	89-100	49-100
Tetrachloroethylene	97-100	99-100	58-100
Benzene	95-100	79-100	82-100
o-Xylene	91-100	57-100	58-100
Ethylbenzene	82-100	70-100	64-100
Often Present			
n-Octane	81-99	59-94	20-96
m,*p*-Dichlorobenzene	79-100	61-87	0-75
α-Pinene	62-98	47-92	0-85
n-Undecane	56-99	48-74	8-88
n-Decane	53-96	25-81	48-100
Trichloroethylene	50-97	4-66	0-72
Styrene	47-100	37-94	56-91
Occasionally Found			
Chloroform	36-99	31-80	12-79
n-Dodecane	30-96	17-45	0-77
Carbon Tetrachloride	12-100	11-100	14-96
1,4-Dioxane	8-70	3-21	5-25
1,2-Dichloroethane	4-68	0-23	0-30
o-Dichlorobenzene	13-59	0-19	0-19
Chlorobenzene	1-12	0-8	0-18
1,1,2,2-Tetrachloroethane	0-10	1-18	0-18
1,2-Dibromoethane	0-4	0-13	0-2
1,1,1,2-Tetrachloroethane	0-3	0-12	0-18

[a] Range over four air media and breath.

TABLE 4. TARGET COMPOUNDS SORTED BY WEIGHTED PERCENT MEASURABLE IN WATER BY SITE AND SEASON

	% Measurable		
	Los Angeles		Contra Costa
	Winter	Summer	Summer
Ubiquitous Compounds			
Chloroform	94	86	94
Bromodichloromethane	93	96	96
Dibromochloromethane	89	85	85
Bromoform	69	90	69
Occasionally Found			
1,1,1-Trichloroethane	48	14	10
Tetrachloroethylene	22	19	94
Chlorobenzene	13	5	6
Trichloroethylene	8	12	66

TABLE 5. SAMPLE SIZE RANGES BY SITE, SEASONS AND MEDIA

	Los Angeles Winter 1984	Los Angeles Summer 1984	Contra Costa Summer 1984
Breath	112-115	51	66-69
Overnight Personal Air	110-114	50-51	69-70
Daytime Personal Air	110-114	50-51	66-68
Overnight Outdoor Air	24-25	23	10
Daytime Outdoor Air	23-25	24	9-10
Water	117	52	71
Population Estimate:	359,500	332,600	90,700

52 people previously studied in the first trip. In June, 71 people in Contra Costa County were monitored for the same media as Los Angeles.

The same size ranges for the various sites and seasons are given by media in Table 5. There was some variation in sample size due to missing data. The sample sizes for outdoor air were smaller because outdoor air monitors were mounted one per sample segment rather than one per household.

The data were examined for percent measurable, concentration levels, comparisons of outdoor versus indoor levels, comparisons between sites and seasons, and correlations between media. Since a probability sample was used to select the participants, the weighted results apply to the target population (see Table 5) of the areas (see Section 4 for a detailed description of the sampling procedures).

Percent Measurable

The twenty six compounds analyzed in breath, air and water samples can be sorted into three categories based on weighted percent of samples with concentrations measurable (i.e., exceeding the quantifiable limit). For breath and air samples, the first category, ubiquitous compounds (more than 50% measurable in most sample types), included m,p-xylene, 1,1,1-trichloroethane, tetrachloroethylene, benzene, o-xylene, and ethylbenzene (see Table 3). Those compounds often found were n-octane, m,p- dichlorobenzene, α- pinene, n- undecane, n-decane, trichloroethylene, and styrene. Chloroform, n-dodecane, carbon tetrachloride, 1,4-dioxane, 1,2-dichloroethane, o-dichlorobenzene, chlorobenzene, 1,2-dibromoethane, and 1,1,2,2-tetrachloroethane were occasionally found in air and breath samples. The percentages measurable in Los Angeles tended to be higher in the winter.

Fewer target chemicals were studied in drinking water. Chloroform, bromodichloromethane, dibromochloromethane, and bromoform were found in 70% or more of the samples (see Table 4). Tetrachloroethylene and trichloroethylene were found in less than 25% of the water samples for Los Angeles and 66% or more of the Contra Costa samples, while 1,1,1-trichloroethane was found in almost half of the winter samples of Los Angeles and less than 15% of the summer samples for Los Angeles or Contra Costa. Chlorobenzene was found in less than 15% of all water samples.

Concentrations

Daytime air, breath and water weighted median concentrations are given for Los Angeles and Contra Costa in Tables 6 and 7. The medians are given for only those compounds which had relatively high percents measurable and sufficiently high levels to warrant further investigation. Overnight air will be examined later. All median estimates in Tables 6 and 7 are weighted and apply to the target populations of 359,500 for winter and 332,600 for summer in Los Angeles and 90,700 for summer in Contra Costa. For almost all compounds, the daytime personal air median was higher than that for daytime outdoor air (see Table 8). Also, daytime personal air levels tended to be higher than breath levels for both sites and seasons. In winter, the outdoor air levels tended to be much higher than the breath levels in Los Angeles, while in summer this trend does not appear. This was due to relatively high outdoor air levels in Los Angeles in winter.

For water only, chloroform, bromodichloromethane and dibromochloromethane had consistently non-negligible concentrations with levels higher in summer than winter for Los Angeles and relatively high levels of chloroform in Contra Costa (see Table 7).

Comparisons Between Seasons for Los Angeles

For the fifty one people who participated in both seasons of the Los Angeles study, Table 9 compares the weighted median concentrations for breath, daytime personal air and daytime outdoor air. Generally, the medians showed a slight tendency to be higher in winter for breath. This trend appears more pronounced for daytime personal air, while for daytime outdoor air many chemicals had medians over three times larger in winter. These trends can also be seen in Figures 1 through 3.

Comparisons Between Sites for Summer

The summer median concentrations for air and breath samples in Los Angeles and Contra Costa are compared in Table 10. While breath and daytime personal air concentrations tended to be slightly higher in Los Angeles, the daytime outdoor medians were often two or more times larger in Los Angeles than Contra Costa. These trends can be readily seen in Figures 1 through 3.

TABLE 6. WEIGHTED MEDIANS ($\mu g/m^3$) FOR AIR AND BREATH CONCENTRATIONS OF ORGANIC COMPOUNDS IN LOS ANGELES AND CONTRA COSTA

	Los Angeles						Contra Costa		
	Winter			Summer			Summer		
		Daytime Air			Daytime Air			Daytime Air	
Compounds	Breath	Personal	Outdoor	Breath	Personal	Outdoor	Breath	Personal	Outdoor
m,p-Xylene	2.3	23	21	1.4	18	6.7	1.1	10	1.2
1,1,1-Trichloroethane	6.3	19	20	3.8	11	5.3	0.1	5.5	2.2
Tetrachloroethylene	5.8	8.2	9.0	4.0	3.4	1.7	2.0	2.2	0.2
Benzene	3.1	15	14	4.2	7.2	3.1	1.8	6.3	1.3
o-Xylene	0.7	10	7.9	0.5	4.0	2.2	0.4	3.6	0.4
Ethylbenzene	0.8	8.0	7.1	0.5	6.0	1.9	0.4	2.9	0.4
n-Octane	0.5	4.1	1.9	0.8	3.2	0.5	0.5	2.3	0.2
m,p-Dichlorobenzene	0.5	2.2	1.0	0.6	0.9	0.4	0.9	0.9	0.2
a-Pinene	0.9	1.9	0.2	0.9	1.6	0.3	0.3	1.0	0.0
n-Undecane	0.4	2.8	1.2	0.3	1.2	0.5	0.7	1.3	0.5
n-Decane	0.3	2.2	1.1	0.3	1.8	0.5	0.7	1.0	3.4
Trichloroethylene	0.2	2.2	0.5	0.2	1.2	0.0	0.2	0.5	0.1
Styrene	0.2	2.3	1.9	0.2	1.5	0.6	0.5	0.8	0.2
Sample Size	112-115	110-114	23-25	51	50-51	24	66-69	66-68	9-10

TABLE 7. WEIGHTED MEDIANS (ng/mL) OF ORGANIC COMPOUNDS IN DRINKING WATER IN LOS ANGELES AND CONTRA COSTA

Compounds	Los Angeles Winter	Los Angeles Summer	Contra Costa Summer
Chloroform	14	33	49
Bromodichloromethane	12	24	17
Dibromochloromethane	11	32	6.4
Bromoform	0.5	3.0	0.6
Sample Size	117	52	71

TABLE 8. RATIO OF DAYTIME PERSONAL AIR TO DAYTIME OUTDOOR AIR WEIGHTED MEDIANS FOR LOS ANGELES AND CONTRA COSTA

Compounds	Los Angeles Winter	Los Angeles Summer	Contra Costa Summer
m,p-Xylene	1.1	2.7	8.3
1,1,1-Trichloroethane	1.4	2.1	2.5
Tetrachloroethylene	0.9	2.0	9.2
Benzene	1.1	2.3	4.8
o-Xylene	1.3	1.8	9.7
Ethylbenzene	1.1	3.2	7.2
n-Octane	2.2	6.4	10
m,p-Dichlorobenzene	2.3	2.3	6.1
a-Pinene	7.6	5.3	19
n-Undecane	2.3	2.4	2.8
n-Decane	2.0	3.6	0.3
Trichloroethylene	4.8	40	4.6
Styrene	1.2	2.4	4.6

TABLE 9. RATIO OF WINTER TO SUMMER WEIGHTED MEDIANS FOR THOSE PARTICIPATING IN BOTH SEASONS IN LOS ANGELES FOR BREATH, DAYTIME PERSONAL AND OUTDOOR AIR

	Ratio of Winter to Summer		
Compounds	Breath	Daytime Personal Air	Daytime Outdoor Air
m,p-Xylene	1.7	1.2	3.1
1,1,1-Trichloroethane	1.5	2.2	3.8
Tetrachloroethylene	1.4	2.4	5.3
Benzene	0.7	1.8	4.5
o-Xylene	1.8	2.4	3.5
Ethylbenzene	1.5	1.4	3.7
n-Octane	0.7	1.2	3.8
m,p-Dichlorobenzene	0.8	1.9	2.1
a-Pinene	1.2	1.4	0.9
n-Undecane	1.2	2.1	2.1
n-Decane	1.2	1.4	2.2
Trichloroethylene	1.0	1.8	17
Styrene	1.0	1.6	3.0
Sample Size:	49-51	49-50	22-24

TABLE 10. RATIO OF LOS ANGELES SUMMER TO CONTRA COSTA WEIGHTED MEDIANS FOR BREATH, DAYTIME PERSONAL AND OUTDOOR AIR

	Ratio Los Angeles to Contra Costa		
Compounds	Breath	Daytime Personal Air	Daytime Outdoor Air
m,p-Xylene	1.3	1.8	5.6
1,1,1-Trichloroethane	44	2.0	2.4
Tetrachloroethylene	2.0	1.6	7.1
Benzene	2.3	1.1	2.4
o-Xylene	1.3	1.1	6.1
Ethylbenzene	1.2	2.1	4.8
n-Octane	1.5	1.4	2.3
m,p-Dichlorobenzene	0.7	1.0	2.7
a-Pinene	2.8	1.6	5.9
n-Undecane	0.5	1.0	1.1
n-Decane	0.5	1.8	0.2
Trichloroethylene	1.0	2.4	0.2
Styrene	0.3	1.8	3.6

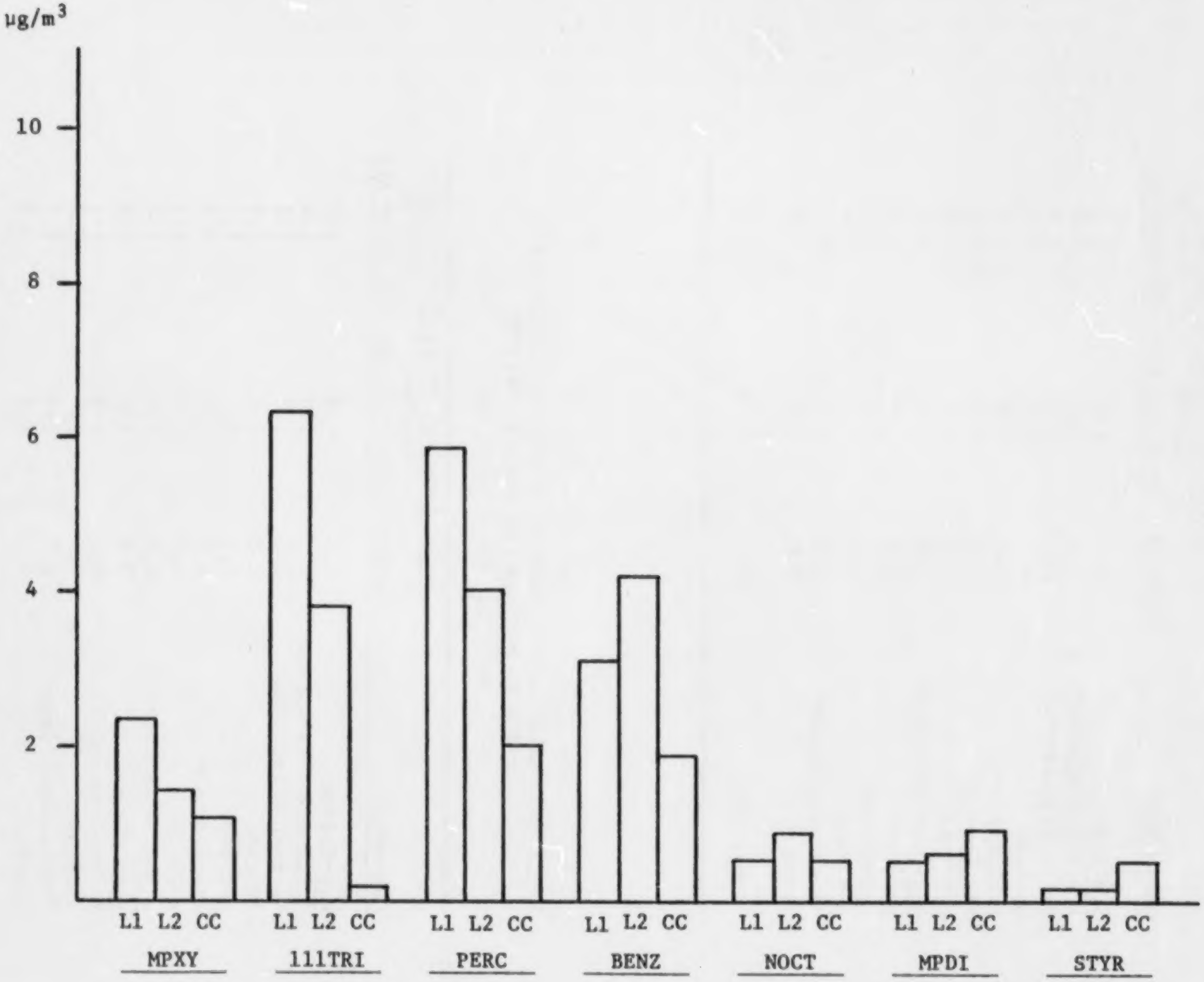

Figure 1. Weighted median concentrations of m,p-Xylene (MPXY), 1,1,1-Trichloroethane (111TRI), Tetrachloroethylene (PERC), Benzene (BENZ), n-Octane (NOCT), m,p-Dichlorobenzene (MPDI), and Styrene (STYR) for breath in Los Angeles winter (L1), Los Angeles summer (L2) and Contra Costa (CC).

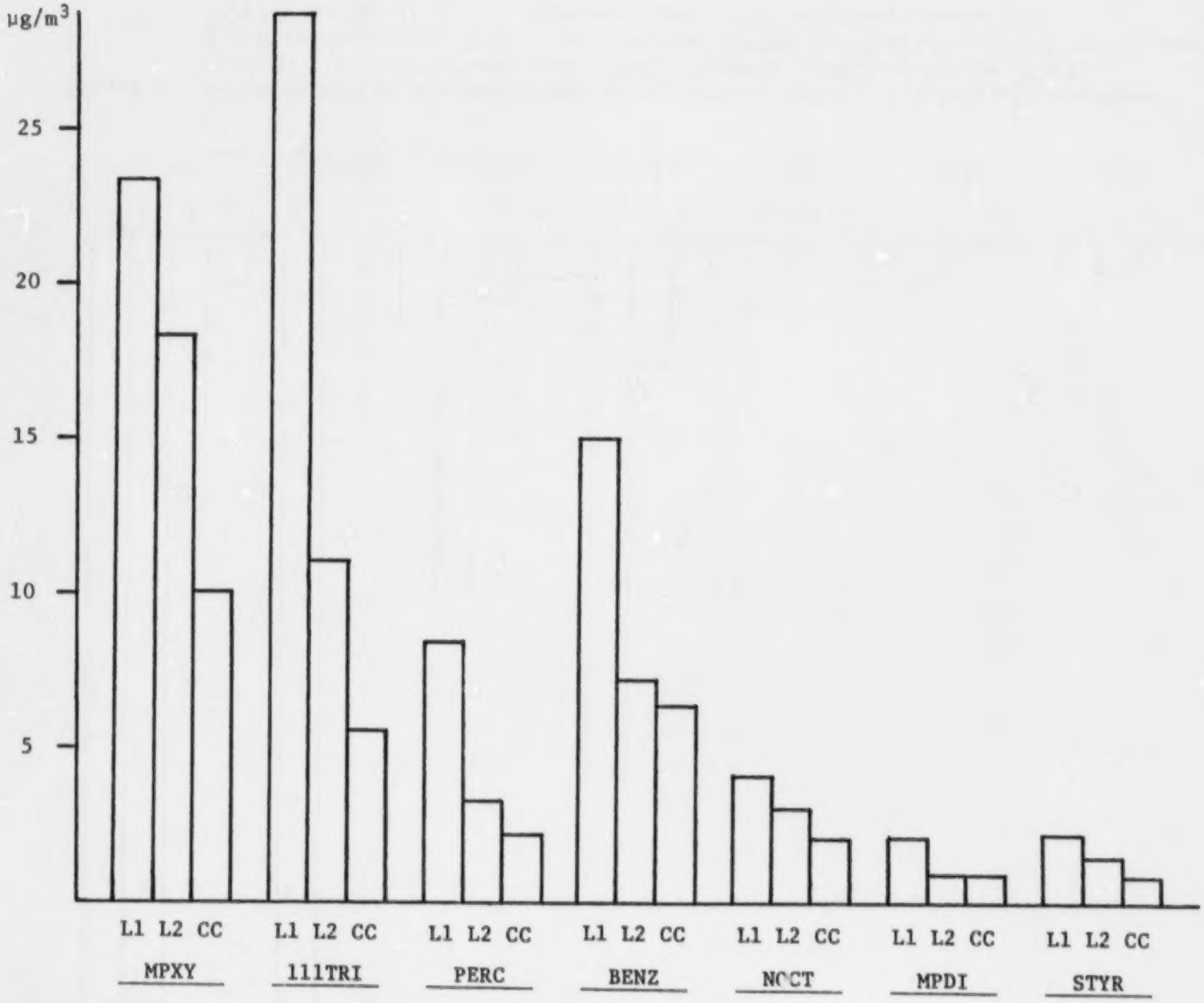

Figure 2. Weighted median concentrations of m,p-Xylene (MPXY), 1,1,1-Trichloroethane (111TRI), Tetrachloroethylene (PERC), Benzene (BENZ), n-Octane (NOCT), m,p-Dichlorobenzene (MPDI), and Styrene (STYR) for daytime personal air in Los Angeles winter (L1), Los Angeles summer (L2) and Contra Costa (CC).

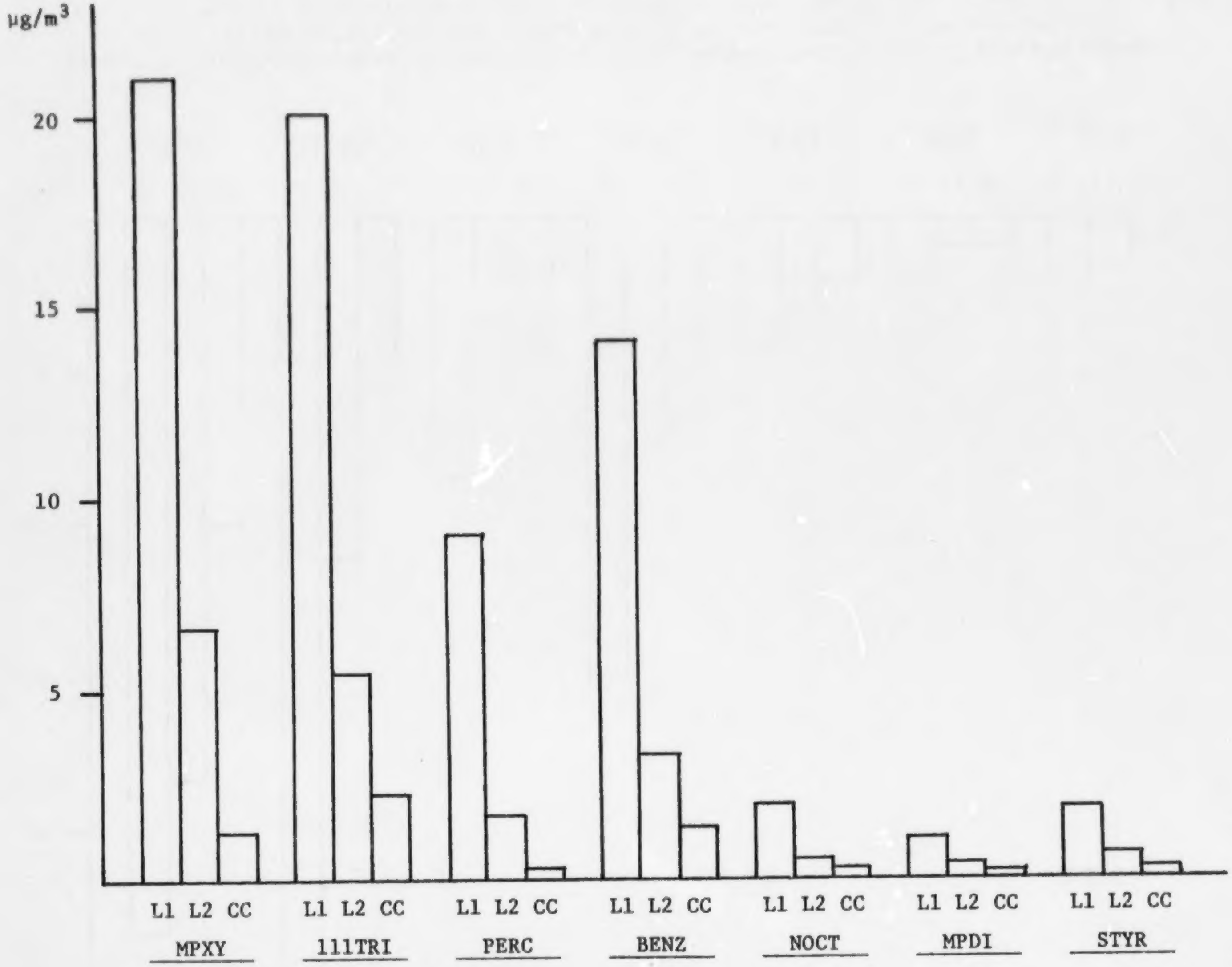

Figure 3. Weighted median concentrations of m,p-Xylene (MPXY), 1,1,1-Trichloroethane (111TRI), Tetrachloroethylene (PERC), Benzene (BENZ), n-Octane (NOCT), m,p-Dichlorobenzene (MPDI), and Styrene (STYR) for daytime outdoor air in Los Angeles winter (L1), Los Angeles summer (L2) and Contra Costa (CC).

Outdoor Versus Indoor Levels

In order to compare indoor and outdoor air concentration levels, Table 11 gives unweighted medians for overnight personal air and overnight outdoor air by site and season for the people who had air monitors outside their homes. Table 12 also presents ratios of these medians. The personal and outdoor air levels were highest in Los Angeles in the winter and lowest in Contra Costa. For Contra Costa, almost all of the compounds had significantly higher medians in personal air than outdoor air (see Table 12). For Los Angeles in summer (see Figure 5 and Table 12), while all but one compound (styrene) showed higher medians in personal air, only about half were significantly higher. For Los Angeles in winter (see Figure 4), the outdoor air medians were sometimes higher than those for personal air. This was because the outdoor levels in winter were particularly high in Los Angeles.

Table 12 also gives the ratios for the maximum concentration levels. For most compounds over both sites and seasons, the ratios of overnight personal air to overnight outdoor air were higher for the maximum levels than for the medians. This indicates that not only did personal air concentrations tended to be greater than outdoor air concentrations but at the higher levels of exposure the concentrations were sometimes much greater.

Correlations

For Los Angeles, eleven of the thirteen prevalent compounds in breath were significantly correlated (at the .05 level) with the previous twelve-hour personal air exposures (see Table 13). However, with the exception of 1,1,1-trichloroethane, trichloroethylene, and m,p-dichlorobenzene, these correlations were less than .5. The correlations between breath and daytime outdoor air and between daytime personal air and daytime outdoor air tended to be lower. Generally, the correlations between overnight personal air and overnight outdoor air were higher than those between daytime personal and daytime outdoor air.

TABLE 11. UNWEIGHTED MEDIANS ($\mu g/m^3$) FOR THOSE PERSONS HAVING OVERNIGHT PERSONAL AND OUTDOOR AIR BY SITE AND SEASON

Compounds	Los Angeles				Contra Costa	
	Winter		Summer		Summer	
	Overnight Personal Air	Overnight Outdoor Air	Overnight Personal Air	Overnight Outdoor Air	Overnight Personal Air	Overnight Outdoor Air
m,p-Xylene	25	30	8.2	7.8	6.2*	1.4
1,1,1-Trichloroethane	24	29	7.9*	4.0	4.2*	2.1
Tetrachloroethylene	8.9	7.4	1.7	1.3	2.1*	0.2
Benzene	18	17	4.8*	2.9	3.6*	1.6
o-Xylene	11	11	2.6	2.1	2.2*	0.5
Ethylbenzene	9.7	11	2.2	2.0	1.8*	0.6
n-Octane	4.6	4.3	1.6*	0.9	1.4*	0.4
m,p-Dichlorobenzene	2.8*	1.8	1.0*	0.7	0.4	0.2
a-Pinene	3.4*	0.8	1.4*	0.3	1.4*	0.1
n-Undecane	2.9*	2.0	1.0	0.5	0.9*	0.1
n-Decane	1.9	2.6	0.9*	0.5	0.6	2.0
Trichloroethylene	1.2*	0.7	0.5*	0.1	0.4*	0.1
Styrene	3.6	4.2	0.6	0.6	0.4	0.3
Sample Size:	24-25		23		10	

* Wilcoxon signed rank test for difference within season significant at .05 level.

TABLE 12. RATIO OF OVERNIGHT PERSONAL TO OVERNIGHT OUTDOOR AIR UNWEIGHTED MEDIANS AND MAXIMUM LEVELS FOR THOSE PERSONS HAVING AIR MONITORS OUTSIDE THEIR HOMES BY SITE AND SEASON

	Los Angeles				Contra Costa	
	Winter		Summer		Summer	
Compounds	Median	Maximum	Median	Maximum	Median	Maximum
m,p-Xylene	0.9	1.1	1.0	3.6	4.3*	6.8
1,1,1-Trichloroethane	0.8	1.0	2.0*	4.7	2.0*	1.5
Tetrachloroethylene	1.2	2.8	1.3	12	8.4*	1.6
Benzene	1.1	1.3	1.7*	3.4	2.3*	6.1
o-Xylene	1.0	1.2	1.2	4.6	4.7*	7.3
Ethylbenzene	0.9	1.1	1.1	2.7	2.8*	5.9
n-Octane	1.1	3.2	1.7*	12	3.9*	1.2
m,p-Dichlorobenzene	1.6*	10	1.4*	72	1.8	7.2
a-Pinene	4.2*	9.2	5.5*	13	29 *	3.7
n-Undecane	1.5*	0.6	2.0	13	9.0*	10
n-Decane	0.8	0.4	1.9*	8.5	0.3	3.7
Trichloroethylene	1.8*	17	4.8*	4.6	3.2*	13
Styrene	0.9	1.0	1.0	1.7	1.5	2.0
Sample Size:	24-25		23		10	

* Medians significantly different within season at .05 level based on Wilcoxon signed rank test.

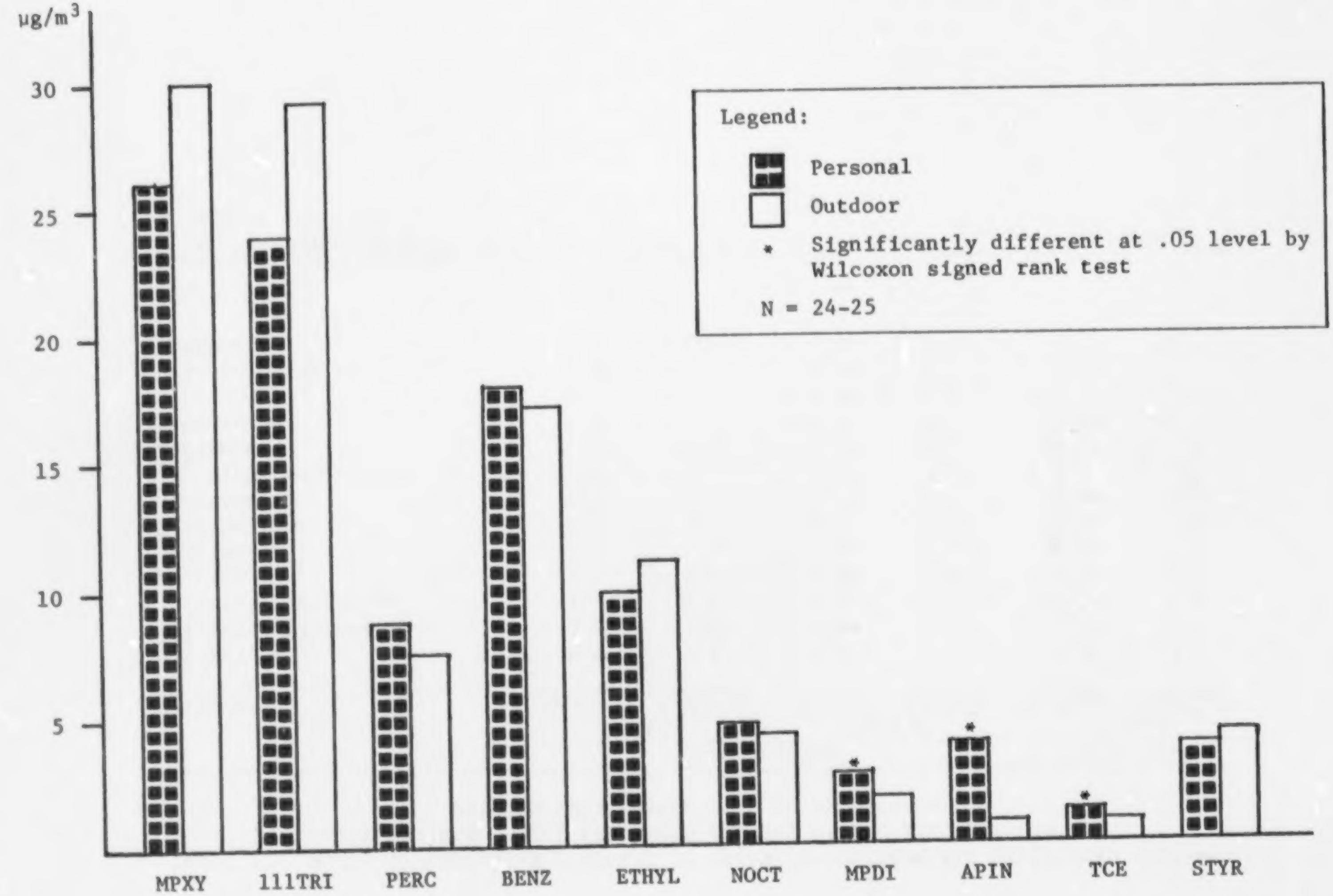

Figure 4. Unweighted median concentrations of m,p-Xylene (MPXY), 1,1,1-Trichloroethane (111TRI), Tetrachloroethylene (PERC), Benzene (BENZ), Ethylbenzene (ETHYL), n-Octane (NOCT), m,p-Dichlorobenzene (MPDI), a-Pinene (APIN), Trichloroethylene (TCE) and Styrene (STYR) for overnight personal and outdoor air in Los Angeles winter.

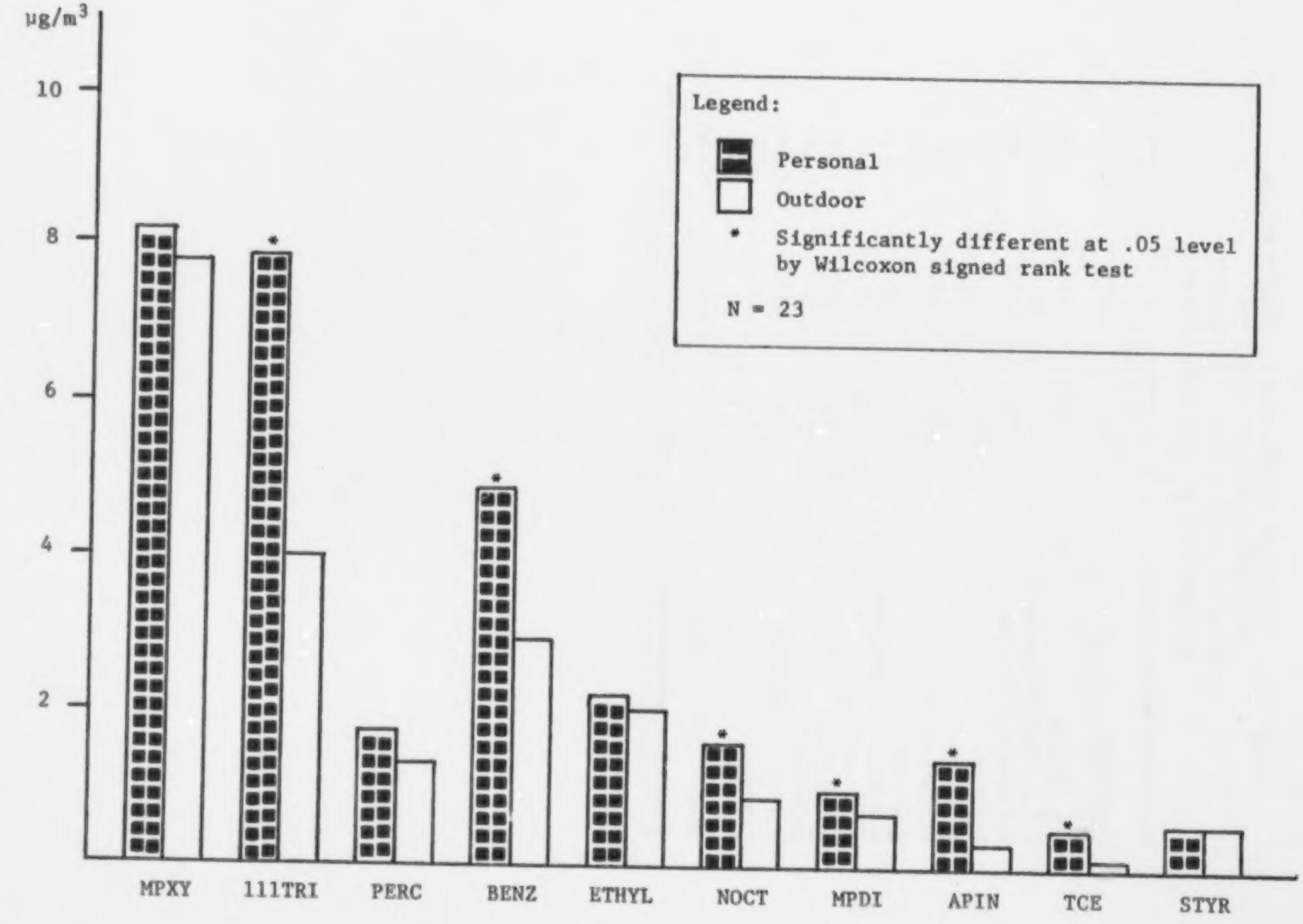

Figure 5. Unweighted median concentrations of m,p-Xylene (MPXY), 1,1,1-Trichloroethane (111TRI), Tetrachloroethylene (PERC), Benzene (BENZ), Ethylbenzene (ETHYL), n-Octane (NOCT), m,p-Dichlorobenzene (MPDI), a-Pinene (APIN), Trichloroethylene (TCE) and Styrene (STYR) for overnight personal and outdoor air in Los Angeles summer.

TABLE 13. SPEARMAN CORRELATIONS BETWEEN BREATH
CONCENTRATIONS AND PRECEDING
DAYTIME 12-HOUR PERSONAL EXPOSURES
TO COMPOUNDS BY SITE AND SEASON

	Los Angeles		Contra Costa
Compounds	Winter	Summer	Summer
m,p-Xylene	.42*	.44*	.25*
1,1,1-Trichloroethane	.57*	.60*	.25*
Tetrachloroethylene	.32*	.30*	.46*
Benzene	.20*	.32*	.07
o-Xylene	.40*	.41*	.17
Ethylbenzene	.45*	.36*	.06
n-Octane	.16	.23	-.09
m,p-Dichlorobenzene	.69*	.38*	.49*
a-Pinene	.21*	.12	.24
n-Undecane	.19	.02	.13
n-Decane	.25*	.10	.27*
Trichloroethylene	.68*	.60*	.38*
Styrene	.20*	.18	-.00
Sample Size Range:	105-112	49-50	63-65

* Significantly different from zero at .05 level.

SECTION 4

STATISTICAL SAMPLE DESIGN AND WEIGHTING

INTRODUCTION

Phase III of the TEAM study was conducted at two purposively chosen target areas in California: an area in Southeast Los Angeles County and the Antioch/ Pittsburg area northeast of San Francisco. Technically, the Los Angeles study area consists of the union of the following geographic areas as defined by the U.S. Bureau of the Census for the 1980 Decennial Census:

(1) All of the following Places: El Segundo, Manhattan Beach, Hermosa Beach, Redondo Beach, Torrance, Lomita, Carson, and West Carson.

(2) Tract 6023.02 in Hawthorne.

(3) Tract 6040 in Lawndawn.

(4) Tract 6032 in Gardena.

(5) Tracts 2913, 2921, 2931, 2932.01, 2932.02, and 2933 in Los Angeles.

(6) Tracts 2921, 5435.01, 6023.02, and 6214 in the unincorporated portion of Los Angeles county.

Likewise, the Antioch/Pittsburg study area is technically defined as the union of the following Census-defined geographic areas:

(1) All of the following Places: Antioch, Pittsburg, and West Pittsburg.

(2) Tracts 3050 and 3120 in the unincorporated portion of Contra Costa County.

(3) Blocks 101, 102, and 319 in Tract 3060 in the unincorporated portion of Contra Costa County.

(4) All of Tract 3090 in the unincorporated portion of Contra Costa County except Blocks 425, 925, and 926.

(5) Blocks 504 and 911 in Tract 3142 in the unincorporated portion of Contra Costa County.

(6) Block 201 in Tract 3110 in the unincorporated portion of Contra Costa County.

In more general terms, the Los Angeles study area may be described as a Northwest to Southeast corridor bounded roughly by Los Angeles International Airport on the north, the Pacific Ocean on the west, Los Angeles Harbor on the south, and the city of Long Beach on the east. Alternatively, this area may also be described as the city of Torrance, California and the adjoining cities immediately to the east and west of Torrance. This corridor was chosen for monitoring personal exposure and body-burden with regard to organic chemicals partly because of the presence of chemical and petrochemical plants as well as the international airport in the area. The location of the Los Angeles study area is shown on the map in Appendix A.

The Antioch/Pittsburg study area may be described as the cities of Antioch, Pittsburg, and West Pittsburg plus the neighboring suburban areas. The location of the Antioch/Pittsburg study area is shown on the map in Appendix B.

Two seasons of personal exposure and body-burden monitoring were conducted in the Los Angeles study area. The first season monitoring was conducted during January and February 1984. A subsample of the individuals who participated in the first season study was selected for the second season of monitoring, which was conducted during May and June 1984.

Only one season of monitoring was conducted at the Antioch/Pittsburg study area. The Antioch/Pittsburg monitoring was conducted during June of 1984.

For each target area of the Phase III TEAM study, the statistical sample design may be summarily described as a stratified three stage sample survey design. The first stage sampling units (FSUs) were blocks or combinations thereof as defined by the U.S. Bureau of the Census for the 1980 Decennial Census. A stratified sample of the FSUs was selected with probabilities proportional to the occupied housing count for the FSU from a 1980 Census data tape. A noncompact cluster of housing units was selected at the second stage within each selected FSU. A short screening interview was conducted for each participating sample household. The purpose of the screening interview was to collect data from a knowledgeable adult household member concerning the age, sex, smoking status, and occupation of all household members. These data were used to stratify the third stage sample of individuals selected for personal exposure and body-burden monitoring. In addition to stratification by age, sex, and smoking status, the occupation data were used to stratify by potential for occupational exposure to the organic chemicals being monitored. The primary purpose of this stratification was to oversample people with potentially high exposure levels to facilitate more accurate estimation of the population distribution of exposure. Since analysis of the Phase II TEAM database had indicated that high exposures were often occupation-related, individuals suspected of having high potential for occupational exposure were oversampled for monitoring.

Probability sampling methods have been used so that the data collected can be used to make strictly valid statistical inferences concerning the populations sampled. Hence, sampling weights have been computed that reflect the procedures used for sample selection. The weight of a sample unit can be viewed as the number of units in the target population that the sample unit represents. The initial sampling weight for a unit is calculated as the reciprocal of either the probability of selection or the expected frequency of selection when sampling with replacement. The initial sampling weights have been adjusted to reduce the potential bias caused by nonresponse. The final analysis weights, adjusted sampling weights, serve to differentially weight the sample data to reflect the level of disproportionality in the final sample relative to the population of interest.

TARGET POPULATION

The target populations for the first season Phase III TEAM studies consist of those individuals who satisfy the following criteria:

(1) Primary place of residence was in the study area (Based on the boundaries of 1980 Census geographic units) when the household screening was conducted.

(2) Aged 7 years or older at the time of the household screening.

(3) Not living in group quarters[1] or on a military reservation.

(4) Present in the study area at the time of personal exposure, body-burden, and fixed-site monitoring.

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[1] A group quarters is any living quarters, including houses or individual units in an apartment complex, in which ten or more unrelated persons reside. Group quarters include dormitories, barracks, prisons, etc.

The target population for the Los Angeles second season study is that subset of the first season target population members who were residing in and present in the study area at the time that second season personnel exposure and body-burden monitoring was conducted.

FIRST STAGE SAMPLE OF AREA SEGMENTS

The first stage sampling units for the Phase III TEAM samples were constructed from 1980 Decennial Census geographic units. All enumeration district (ED) and block records were extracted from the 1980 Census Summary Tape File 1B (STF 1B) for the geographic areas containing the target population. None of the records extracted were ED records; they were all block-level records. The first stage sampling units (FSUs) were then defined to be individual blocks or combinations thereof. For each study site the block-level records were combined as necessary to form FSUs that each had at least a fixed requisite 1980 Census count of occupied housing units. A minimum of 55 occupied housing units was required for each Los Angesles FSU, and 65 occupied housing units was required for each Antioch/Pittsburg FSU. The reason for this difference is that a sample of 25 FSUs with an average of 50 sample housing units per FSU was planned for Los Angeles. For Antioch/Pittsburg, a sample of 10 FSUs with an average of 60 sample housing units pwer FSU was planned.

The first stage sampling frame for each study site was stratified geographically and by socioeconomic status as shown in Table 14. The purpose of the geographic stratification was to guarantee representation of geographic subdivisions of the study areas because personal exposure and body burden could vary geographically for the organic chemicals being monitored. Moreover, an index of socioeconomic status was defined and used as the second dimension of stratification for the first stage sample, which would increase the precision of exposure and body-burden statistics if the monitored levels were related to socioeconomic status.

Stratification with regard to potential point sources of the organic chemicals being monitored was considered but not implemented. Fixed-site air monitoring was performed in the vicinity of potential point sources. The levels observed for the organic chemicals being monitored were not considered

TABLE 14. FIRST STAGE SAMPLING STRATA

Study Site	Geoegraphic Area	Socioeconomic Status	Sample Size
Los Angeles	East of Torrance	Low	4
		High	3
	Torrance and Lomita	Low	5
		High	5
	West of Torrance	Low	4
		High	4
	SUBTOTAL		25
Antioch/Pittsburg	Pittsburg	Low	3
		High	2
	Antioch	Low	2
		High	3
	SUBTOTAL		10

to be sufficiently high to validate the existence of point sources. Hence, no stratification by potential point sources was performed.

Three geographic strata were defined for the Los Angeles study area. These strata were: (1) the cities of Torrance and Lomita; (2) the portion of the target area to the east of Torrance and Lomita; and (3) the portion of the target area to the west of Torrance and Lomita. Likewise, two geographic strata were defined for the Antioch/Pittsburg study area as follows: (1) the city of Antioch and adjacent unincorporated portions of the target area; and (2) the cities of Pittsburg and West Pittsburg plus the adjacent unincorporated portions of the target area.

Socioeconomic stratification of the first stage sample was based on an index of socioeconomic status computed from the Census STF 1B data records used to define the first stage sampling units. The algorithm used to compute this index has been used by RTI for several years for socioeconomic stratification of area household samples. The Census STF 1B data records were used to compute the following statistics for each FSU on the sampling frame: (1) median property value of owner-occupied dwelling units; (2) median rent for renter-occupied dwelling units; and (3) the proportion of occupied dwelling units that do not have complete plumbing facilities (hot and cold running water and private toilet). Each FSU was assigned a rank with respect to each of these socioeconomic measures. The socioeconomic index was then computed for each FSU as the weighted average of these three ranks using the number of housing units upon which each measure was based as the weight. This procedure yields an index which is a continuous measure roughly between unity and the Census count of housing units represented by the first stage frame. The low end of the scale identifies those FSUs with the greatest number of disadvantaged individuals relative to other units in the target area.

The values of the socioeconomic index were computed separately within each geographic stratum of the first stage sample. Within each stratum, each FSU was placed in the high or low socioeconomic stratum based on a high or low value of the socioeconomic index, respectively. The division into high and low socioeconomic strata was performed in such a way that approximately half of the housing units were placed in the high socioeconomic stratum and half were placed in the low socioeconomic stratum within each geographic stratum, based upon the 1980 Census count of occupied housing units.

A sample of 25 FSUs was selected for the Los Angeles study area, and 10 FSUs were selected for the Antioch/Pittsburg area. For each target area the sample size was first allocated to the explicit strata shown in Table 14 in proportion to the total 1980 Census count of occupied housing units represented by the stratum. These proportional allocations were then randomly rounded[2] to integral values so that exact proportional allocation was achieved in expectation. The rounded integral sample sizes are presented for each stratum in Table 14.

Given the stratum sample sizes, the first stage units were selected within each stratum with probabilities proportional to size as measured by the 1980 Census count of occupied housing units. A sequential minimum probability replacement algorithm (1,2) was used to select the FSUs within each stratum. The frame records were serpentine ordered by Census Tract and size within each stratum.[3] Since the sample was sequentially selected from an ordered sampling frame, the sample was proportionaly allocated to the implicit strata defined by Census Tract and size of FSU. This additional stratification resulted in greater geographic dispersion of the sample FSUs and increased the likelihood that at least one small FSU would be selected.

In order to facilitate selection of a probability sample of housing units from each sample FSU, or sample segment, a list of all housing units in each segment was prepared as described in Section 5. For the Antioch/Pittsburg study area, a considerable amount of new construction had occurred in two of the sample segments. Each of these segments was divided into subsegments that contained 65 or more housing units based upon a quick field count of the housing units. One subsegment was then selected within each segment with probability proportional to size as measured by the field count of housing units.

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[2] For example, an allocation of 2.25 units would be rounded to 3 units with probability 0.25 and rounded to 2 units with probability 0.75.

[3] Small to large in the first Tract, large to small in the second Tract, small to large in the large Tract, etc. See (1) for further examples of serpentine ordering.

The locations of the ultimate sample segments are shown on the maps in Appendices A and B for the Los Angeles and Antioch/Pittsburg study areas, respectively.

SECOND STAGE SAMPLE OF HOUSING UNITS

The second stage in selection of the Phase II TEAM samples was selection of a noncompact cluster of housing units from each sample segment, i.e., from each FSU selected into the first stage sample. The housing units in each sample segment were listed by field staff as described in Section 5. A sample of 1250 housing unit listings was selected for the Los Angeles sample, and 600 housing unit listings were selected for the Antioch/Pittsburg sample.

These housing unit sample sizes were allocated to the sample segments in proportion to the product of the number of listed housing units multiplied by the first stage sampling weights to facilitate equal overall selection probabilities for the sample housing units. Since the first stage units were selected with probabilities proportional to size, these proportional allocations tended to be approximately equal allocations to the segments. Significant departures from equal allocation occured when the first stage size measure differed greatly from the number of housing units listed. For the two Antioch/ Pittsburg segments that had to be subsegmented due to growth, the proportional allocation exceeded the number of listed housing units. Hence, all listed housing units (195 housing units) were selected into the second stage sample for these two segments. The remainder of the sample, 405 housing unit listings, was proportionally allocated to the other eight Antioch/ Pittsburg sample segments. All 1250 sample housing unit listings were proportionally allocated to the 25 sample segments in the Los Angeles sample. Finally, the proportional allocations were randomly rounded to integral values so that the exact proportional allocations were achieved in expectation. These final allocations of the housing unit samples to the sample segments are shown in Tables 15 and 16 for the Los Angeles and Antioch/Pittsburg sample sites, respectively.

The average numbers of housing unit listings selected from each of the Los Angeles and Antioch/Pittsburg sample segments were 50 and 60, respectively. These cluster sizes are relatively large compared to the cluster sizes usually employed for standard area household surveys (e.g., 5 to 25). These

TABLE 15. ALLOCATION OF THE LOS ANGELES HOUSING UNIT SAMPLE TO SAMPLE SEGMENTS

Segment	Number of HU Listings	Number of Sample Listings
101	67	57
102	95	42
103	132	50
104	148	54
105	56	46
106	60	52
107	67	48
108	61	46
109	402	61
110	77	51
111	69	48
112	566	51
113	408	48
114	346	49
115	108	49
116	102	50
117	363	53
118	182	50
119	140	47
120	100	50
121	70	47
122	93	50
123	101	49
124	96	54
125	80	48
TOTAL	3989	1250

TABLE 16. ALLOCATION OF THE ANTIOCH/PITTSBURG HOUSING UNIT SAMPLE TO SAMPLE SEGMENTS

Segment	Number of HU Listings	Number of Sample Listings
201	80	52
202	79	79
203	116	116
204	292	56
205	84	49
206	168	49
207	460	56
208	104	46
209	74	48
210	74	49
TOTAL	1531	600

large cluster sizes were considered appropriate for the Phase III TEAM samples for the following reasons. First, the number of households to be screened was several times greater than the number of people to be selected for personal exposure and body-burden monitoring. Second, in order to maintain reasonable field costs it was necessary to keep the number of sample segments relatively small.

These goals were satisfied by screening a relatively large number of households within each sample segment. Moreover, a high household screening rate was necessary in order to identify a sufficient number of individuals with relatively rare characteristics, e.g., people suspected of having high occupational exposure to the organic chemicals being monitored.

Given the cluster sizes allocated to the sample segments, a sequential sample selection algorithm (1,2) was used to select an equal probability sample of housing units from each sample segment. Due to the proportional allocation of the sample size to the segments described above, all households in the Los Angeles sample have exactly the same overall selection probability and initial sampling weight. Likewise, all housing units in the eight Antioch/Pittsburg sample segments that received a proportional allocation have identically the same overall selection probability and initial sampling weight. Each of the two Antioch/Pittsburg sample segments that had to be subsampled has its own overall household selection probability and initial sampling weight. Thus, the Antioch/Pittsburg sample has three overall household selection probabilities and initial sampling weights depending upon the sample segment in which the household is located.

A half-open interval technique was used during the field operations to guard against undercoverage of the target population due to failure to count and list eligible housing units. That is, each listed sample housing unit was considered to be linked to all missed housing units between the listed sample housing unit and the next listed housing unit. Each such missed housing unit was hence included in the sample with the same selection probability as the housing unit to which it was linked.

THIRD STAGE SAMPLE OF PERSONS SELECTED FOR MONITORING

A short screening interview was attempted for each household selected into the second stage sample. The purpose of this interview was to collect information with regard to the age, sex, smoking status, and occupation of each household member. These data were then used to stratify the third stage sample of people selected for personal exposure and body-burden monitoring. Sample selection strata were defined by age, sex, smoking status, and suspected potential for occupational exposure. The primary purposes of this stratification were: (a) to oversample those individuals who appeared to have greater potential for high exposure levels; and (b) to insure representation of as many of the population subgroups defined by the stratification variables as possible.

Stratification of the person-level sample was facilitated by defining the following stratification variables from the household screening data: AGE, SEX, EXPOSE, and SMOKE. The variables AGE and SMOKE were defined directly from the screening data as follows:

AGE =
1 if $\text{Age} < 7$
2 if $7 \le \text{Age} < 17$,
3 if $17 \le \text{Age} < 65$ or Age missing,
4 if $\text{Age} \ge 65$.

SMOKE =
1 if smoker,
2 if nonsmoker or unknown smoking status.

Whenever the sex of a household member was missing on the household screener, a logical imputation based upon the first name was performed if possible (e.g., Male for John and Female for Mary). If a logical imputation could not be accomplished, the sex item was left blank. The stratification variable SEX was then defined as follows:

SEX =
1 if Male,
2 if Female or missing.

The occupations reported in the household screening data were first classified into the 24 categories shown in Table 17. The occupational coding data on each household screener were manually edited to insure accuracy of coding and to identify additional occupations with suspected high potential for exposure to the organic chemicals being monitored. The frequency of occurrence of the occupational categories in the TEAM Phase III samples is

TABLE 17. OCCUPATIONAL STATUS CODES

Code	Description
	HIGH SUSPECTED OCCUPATIONAL EXPOSURE
01	Painter or employee in a paint factory or paint shop
02	Service station employee, gasoline dispenser
03	Auto or airplane mechanic or garage worker
04	Furniture repair, refinishing, or stripping worker
05	Chemical plant worker
06	Petroleum plant worker
07	Dry cleaning worker
08	Plastics plant worker
09	Textile mill worker
10	Paper mill or wood processing worker
11	Household cleaning worker
12	Photo developer
13	Landscape worker, gardener
14	Pesticide or herbicide applicator
15	Taxi/bus/truck/crane/heavy equipment operator
17	Maintenance worker or custodian
24	Chemistry lab technician or chemist
25	Toll collector
26	Other exposed (Aviation fuel dispenser, airport ground crew worker, plumber)
	LOW SUSPECTED OCCUPATIONAL EXPOSURE
16	Other unexposed occupation
20	Retired/disabled
21	Unemployed
22	Housewife/Househusband
23	Full-time student

shown in Table 18 for the age-eligible sample members (Age $\geq$ 7). The occupational categories were collapsed to two levels of suspected occupational exposure (High and Low) and encoded as follows:

$$\text{EXPOSE} = \begin{cases} 1 \text{ if high suspected occupational exposure,} \\ 2 \text{ if low suspected occupational exposure,} \end{cases}$$

where the high and low suspected occupational exposure categories are defined as shown in Tables 17 and 18. Also, individuals for whom the occupation code was missing after manual editing of the screening data were placed in the low suspected occupational exposure category.

Preliminary analysis of the Phase II TEAM data indicated that suspected occupational exposure was the most important stratification variable when selecting people for personal exposure and body-burden monitoring. Hence, the two-level exposure variable, EXPOSE, was used for explicit stratification of the Phase III TEAM samples so that individuals with high suspected occupational exposure could be oversampled. As shown in Tables 19 and 20, a sample of 40 individuls with high suspected occupational exposure was selected for each Phase III study area. In addition, 150 individuals with low suspected occupational exposure were selected for the Los Angeles study, and 81 for the Antioch/Pittsburg study. These sample sizes were then allocated to the sample segments (first stage units selected into the sample) so that an independent third stage sample could be selected within each first stage unit. This independent selection of third stage sample units within different first stage units results in a nested sample design which facilitates variance estimation. The software for estimation of sampling variances for estimates based upon a complex sample survey often assumes a nested sample survey design.

The sample size for the k-th explicit person-level stratum (k=1 for high suspected occupational exposure; k=2 for low suspected occupational exposure) was allocated to the sample segments in proportion to a measure of the size of the segment for the k-th stratum. The size measure for Los Angeles sample segments was the number of age-eligible (Age $\geq$ 7) screener respondents belonging to the stratum. For the Antioch/Pittsburg sample, the size measure was the weighted estimate of the number of target population members belonging to

TABLE 18. FREQUENCIES FOR OCCUPATIONAL EXPOSURE CATEGORIES

Code[a]	Suspected Exposure	Eligibles Screened	
		Los Angeles	Antioch/Pittsburg
01	High	19	7
02	High	7	3
03	High	34	19
04	High	2	0
05	High	7	21
06	High	8	20
07	High	2	2
08	High	13	0
09	High	0	1
10	High	1	6
11	High	10	5
12	High	5	2
13	High	13	11
14	High	1	2
15	High	34	27
17	High	20	15
24	High	22	5
25	High	1	0
26	High	12	5
16	Low	1598	771
20	Low	231	76
21	Low	93	51
22	Low	269	132
23	Low	230	108
TOTAL		2632	1289

[a] See Table 17.

TABLE 19. ALLOCATION OF THE LOS ANGELES FIRST SEASON SAMPLE TO STRATA AND SAMPLE SEGMENTS

Segment Number	EXPOSE=HIGH		EXPOSE=LOW		TOTAL	
	Screened	Sampled	Screened	Sampled	Screened	Sampled
101	4	1	70	5	74	6
102	9	2	76	4	85	6
103	5	1	95	6	100	7
104	8	1	80	5	88	6
105	13	3	103	6	116	9
106	7	1	122	8	129	9
107	8	1	115	7	123	8
108	7	1	66	4	73	5
109	7	1	82	5	89	6
110	8	2	96	6	104	8
111	6	1	109	6	115	7
112	5	1	48	3	53	4
113	1	0	75	5	76	5
114	6	1	71	5	77	6
115	13	3	113	7	126	10
116	7	1	94	6	101	7
117	3	1	84	5	87	6
118	11	2	55	4	66	6
119	13	2	142	9	155	11
120	8	2	134	8	142	10
121	10	2	138	8	148	10
122	13	3	76	4	89	7
123	16	2	145	9	161	11
124	17	4	132	8	149	12
125	5	1	101	7	106	8
TOTAL	210	40	2422	150	2632	190

TABLE 20. ALLOCATION OF THE ANTIOCH/PITTSBURG SAMPLE TO STRATA AND SAMPLE SEGMENTS

Segment Number	EXPOSE=HIGH Screened	EXPOSE=HIGH Sampled	EXPOSE=LOW Screened	EXPOSE=LOW Sampled	TOTAL Screened	TOTAL Sampled
201	17	3	119	7	136	10
202	18	4	152	10	170	14
203	33	12	144	16	177	28
204	18	5	120	8	138	13
205	11	2	115	7	126	9
206	9	2	83	6	92	8
207	7	2	144	10	151	12
208	15	4	116	7	131	11
209	12	3	71	5	83	8
210	11	3	74	5	85	8
TOTAL	151	40	1138	81	1289	121

the k-th stratum of the segment based on the housing unit weights adjusted for nonresponse. These size measures were used to facilitate equal overall selection probabilities for the members of each stratum. The size measure used for the Antioch/Pittsburg sample was considered most appropriate for this purpose but could not be used for the Los Angeles sample because there was not sufficient time between the household screening and selection of people for monitoring to compute the Los Angeles nonresponse-adjusted household screening weights. The proportional allocations were randomly rounded to integral values so that the exact proportional allocations were achieved in expectation. The resulting allocation of the stratum sample sizes to the sample segments is shown in Tables 19 and 20 for the Los Angeles and Antioch/Pittsburg samples, respectively.

Given the allocation of stratum sample sizes to segments shown in Tables 19 and 20, independent sample was selected from the age-eligible individuals screened in each stratum within each segment. For each segment, a sequential sample selection algorithm (1,2) was used to select an equal probability sample from the age-eligible individuals screened for each stratum. The sampling frame for each stratum within each segment was serpentine ordered by the variables SMOKE, AGE, and SEX, as shown in Table 21. Sequential selection of the sample from this ordered sampling frame resulted in proportional allocation of the sample to the implicit strata defined by levels of the ordering variables. This implicit stratification helped to insure selection of a representative sample with respect to the implicit stratification variables.

The Los Angeles sample was fielded in two waves to insure coming as close as possible to the desired 125 participants. Careful control of the sample size was considered necessary for two reasons. First, the expense of chemical analyses precluded going much over the target sample size. Second, as large a sample as possible was needed to maximize the precision of survey statistics.

The Antioch/Pittsburg sample was fielded in a single wave because of time constraints. Based on previous field experience with the TEAM sampling procedures, the sample fielded was expected to yield the desired 75 participants.

SECOND SEASON SAMPLE OF PERSONS SELECTED FOR MONITORING

A sample of 81 of the 117 first season Los Angeles participants for whom personal exposure and body-burden data were collected was selected for a

TABLE 21. SERPENTINE FRAME ORDERING FOR SELECTION OF PEOPLE FOR MONITORING

Smoke	Age	Sex
1	1	1
1	1	2
1	2	2
1	2	1
1	3	1
1	3	2
1	4	2
1	4	1
2	4	1
2	4	2
2	3	2
2	3	1
2	2	1
2	2	2
2	1	2
2	1	1

second season of monitoring. All 22 first season participants in the high suspected occupational exposure stratum were selected into the second season sample because of special interest in this stratum. A sample of 59 first season participants from the low suspected occupational exposure stratum was allocated to the sample segments so that independent samples could be selected within the sample segments, preserving the nested structure of the sample survey design.

The low suspected exposure stratum sample size of 59 was allocated to the segments in proportion to the number of age-eligible stratum members screened in the segment, subject to the restriction that the allocation to a segment not exceed the number of first season stratum participants in the segment. The proportional allocations were randomly rounded to achieve exactly proportional allocation in expectation. The resulting allocations are presented in Table 22. These allocations facilitated equal initial second season sampling weights when segments were used as the weighting classes for first season nonresponse adjustments.

Given the allocation of the low suspected exposure stratum sample size to segments shown in Table 22, an independent sample of low suspected exposure stratum first season participants was selected within each segment. For each segment, a sequential sample selection algorithm (1,2) was used to select an equal probability sample from the first season low suspected exposure stratum participants.

The first season implicit stratification variables, SMOKE, AGE, and SEX, were not used to stratify the second season sample. The low suspected exposure stratum sample sizes allocated to the segments were so small that no further stratification could be accomplished.

OVERVIEW OF SAMPLE SURVEY WEIGHTING

Probability sampling methods are used in sample surveys so that the data can be used to make inferences regarding the target population. To achieve this objective, sampling weights are computed which reflect the procedures used for sample selection. The weight of a sample unit can be interpreted as the number of units in the target population that the sample unit represents. The initial sampling weight for a unit is usually calculated as the reciprocal of the probability of selection of the unit or the expected frequency of

TABLE 22. ALLOCATION OF THE LOS ANGELES SECOND SEASON SAMPLE TO STRATA AND SAMPLE SEGMENTS

Segment Number	EXPOSE=HIGH		EXPOSE=LOW		TOTAL	
	Frame[a]	Sampled	Frame[a]	Sampled	Frame[a]	Sampled
101	1	1	3	2	4	3
102	0	0	3	2	3	2
103	1	1	3	2	4	3
104	1	1	4	2	5	3
105	1	1	4	2	5	3
106	0	0	8	3	8	3
107	1	1	4	3	5	4
108	0	0	2	2	2	2
109	0	0	3	2	3	2
110	1	1	4	3	5	4
111	0	0	4	3	4	3
112	1	1	2	1	3	2
113	0	0	2	2	2	2
114	1	1	5	2	6	3
115	2	2	3	3	5	5
116	1	1	5	2	6	3
117	0	0	3	2	3	2
118	1	1	2	1	3	2
119	1	1	4	3	5	4
120	1	1	5	4	6	5
121	2	2	7	3	9	5
122	1	1	3	2	4	3
123	2	2	6	4	8	6
124	2	2	2	2	4	4
125	1	1	4	2	5	3
TOTAL	22	22	95	59	117	81

[a] Number of first season respondents.

selection when sampling with replacement. This initial sampling weight is usually adjusted in later steps to reduce the potential bias caused by nonresponse. The final analysis weights, adjusted sampling weights, serve to differentially weight the data to reflect the level of disproportionality in the final sample relative to the population of interest.

Both initial sampling weights and adjusted analysis weights have been computed for the Phase III TEAM samples. The first season samples for the Los Angeles and Antioch/Pittsburg study areas were affected by two levels of nonresponse: household-level nonresponse to the household screening survey and person-level nonresponse by individuals selected for personal exposure and body-burden monitoring. The sampling weights have been adjusted to reduce the potential bias due to each of these sources of nonresponse. In addition, the sampling weights for the second season sample for the Los Angeles study area have been adjusted to reduce the potential bias due to nonresponse of people selected for a second season of personal exposure and body-burden monitoring.

INITIAL SAMPLE SURVEY WEIGHTS

First Stage Sample of Area Segments

The first stage sampling units (FSUs) for the Phase III TEAM study areas were geographic areas defined by U.S. Bureau of the Census geographic variables (i.e., Census blocks and/or combinations thereof). For each study site a stratified sample of FSUs was selected with probabilities proportional to size using a sequential minimum probability replacement sample selection procedure (1,2). For each sample, the FSU size measure was the 1980 Census count of occupied housing units. Six explicit strata were used for the Los Angeles area sample, and four explicit strata were used for the sample for the Antioch/Pittsburg study area.

The strata and sampling units for the Phase III first stage samples can be represented by the following indices:

1. Let h=1,2,...H denote the explicit strata for the first stage sample (H=6 for the Los Angeles study site; H=4 for the Antioch/Pittsburg study site).
2. Let i=1,2,...,N(h) denote all first stage units (FSUs) on the sampling frame for stratum h.

A sample of n_1 FSUs was allocated to the strata ($n_1 = 25$ for Los Angeles; $n_1 = 10$ for Antioch/Pittsburg) in proportion to the stratum sizes as measured by the 1980 Census count of occupied housing units in the stratum. This proportional allocation was randomly rounded so that the exact proportonal allocation was achieved in expectation. Hence, the expected value of the number of selections, $n_1(h)$, allocated to stratum h is given by

$$E[n_1(h)] = n_1 \sum_{i=1}^{N(h)} S(h,i) \Big/ \sum_{h=1}^{H} \sum_{i=1}^{N(h)} S(h,i), \qquad (1)$$

where S(h,i) is the size measure (1980 Census count of occupied housing units) for the i-th FSU in stratum h.

Within each stratum h, a sequential minimum probability replacement algorithm (1,2) was used to make $n_1(h)$ FSU selections with probabilities proportional to size. Hence, the conditional expected number of selections, m(h,i), of the i-th FSU in stratum h, given the stratum h allocation, $n_1(h)$, is given by

$$E[m(h,i)\ n_1(h)] = n_1(h)\ S(h,i) \Big/ \sum_{i=1}^{N(h)} S(h,i). \qquad (2)$$

Therefore, the unconditional expected number of selections of the i-th FSU in stratum h is given by

$$\begin{aligned} E[m(h,i)] &= E\{E[m(h,i)\ n_1(h)]\} \\ &= n_1\ S(h,i) \Big/ \sum_{h=1}^{H} \sum_{i=1}^{N(h)} S(h,i). \end{aligned} \qquad (3)$$

However, two FSUs in the sample for the Antioch/Pittsburg study area were found to contain considerably more housing units than indicated by the 1980 Census count. These two sample FSUs, or sample segments, were divided into subsegments that each contained at least 65 housing units based upon a quick field count of the housing units. One subsegment was then selected within each segment with probability proportional to size as measured by the field count of housing units. The affected segments were the segments numbered 202 and 203. The numbers of housing units counted for the complete segments were 665 and 416 for segments 202 and 203, respectively. The numbers of housing units counted for the subsegments selected into the sample were 79 and 110 for segments 202 and 203, respectively. Selection of subsegments was technically an additional stage within the first stage sample selection process. Hence, the unconditional expected value of the number, $m_u(h,i)$, of selections of the i-th ultimate FSU (segment or subsegment) in stratum h is the product of the expected number of selections of the i-th original frame unit given by equation (3) times the subsegment selection probability. That is, the unconditional expected value of the number, $m_u(h,i)$, of selections of the i-th ultimate FSU in stratum h is given by

$$E[m_u(h,i)] = n_1 \ P(h,i) \ S(h,i) \ / \ \sum_{h=1}^{H} \sum_{i=1}^{N(h)} S(h,i), \qquad (4)$$

where

$$P(h,i) = \begin{cases} 79/665 & \text{for segment 202,} \\ 110/416 & \text{for segment 203,} \\ 1 & \text{otherwise.} \end{cases}$$

Since the FSUs were selected with replacement, the initial sampling weight for each (ultimate) sample FSU is the reciprocal of the expected frequency of selection of the FSU given by equation (4). Hence, the initial sampling weight for the i-th FSU selected from stratum h is given by

$$W_1(h,i) = \sum_{h=1}^{H} \sum_{i=1}^{N(h)} S(h,i) \ / \ n_1 \ P(h,i) \ S(h,i), \qquad (5)$$

where P(h,i) is the subsegment selection probability for the Phase II TEAM samples as defined for equation (4).

Second Stage Sample of Housing Units

The second stage of sampling for each Phase III TEAM sample was selection of a sample of housing units from each FSU selected into the sample, i.e., each sample segment. Selection of the sample housing units was facilitated by listing all housing units in each sample segment. A sample of n_2 housing unit listings was then allocated to the segments (n_2 = 1250 for Los Angeles; n_2 = 600 for Antioch/Pittsburg) in proportion to the product of the number,

$M(h,i)$, of housing units listed for the segment multiplied by the first stage sampling weight for the segment given by equation (5).

This allocation process was necessarily subject to the restriction that the allocation to the i-th FSU in stratum h not exceed the number, $M(h,i)$, of housing units listed for stratum h in the i-th segment. For the two Antioch/Pittsburg sample segments that had to be subsegmented (segments 202 and 203), this restriction resulted in the allocation to these segments being fixed at the number of listed housing units, $M(h,i)$. The remainder of the Antioch/Pittsburg sample (405 sample housing unit listings) was then proportionally allocated to the other sample segments for this study area.

The proportional allocations of the Los Angeles and Antioch/Pittsburg housing unit sample sizes to the sample segments were randomly rounded to integral values to achieve allocations exactly proportional to the product of $M(h,i)$ and the sampling weight given by equation (5). Hence, the expected value of the number, $n_2(h,i)$, of sample housing units to be selected from the i-th FSU of stratum h is given by

$$E[n_2(h,i)] = \begin{cases} M(h,i) & \text{for segments 202 and 203,} \\ \dfrac{n_{2P}\; M(h,i) \;/\; S(h,i)}{\sum\limits_{h=1}^{H} \sum\limits_{i \varepsilon S_{1P}} [M(h,i) \;/\; S(h,i)]} & \text{otherwise,} \end{cases} \qquad (6)$$

where n_{2P} is the housing unit sample size that was proportionally allocated (n_{2P} = 1250 for Los Angeles; n_{2P} = 405 for Antioch/Pittsburg), and S_{1P} denotes the set of first stage units to which the sample size n_{1P} was proportionally allocated. For Los Angeles, S_{1P} includes all 25 sample segments. However, S_{1P} contains all segments in the Antioch/Pittsburg sample except the two segments that had to be subsegmented (segments 202 and 203).

Given the number, $n_2(h,i)$, of housing units to be selected from the i-th FSU of stratum h, the requisite number of housing units was selected from the $M(h,i)$ housing unit listings with equal probabilities using a sequential sample selection algorithm (1,2). The conditional probability of selecting the j-th housing unit listing within the i-th FSU of stratum h, given that the FSU was in the first stage sample (i.e., $i \varepsilon S_1$), is then given by

$$P_2(h,i,j|i\varepsilon S_1) = E[n_2(h,i)] \;/\; M(h,i)$$

$$= \begin{cases} 1 & \text{for segments 202 and 203,} \\ n_{2P} \;/\; \{S(h,i) \sum_{h=1}^{H} \sum_{i\varepsilon S_{1P}} [M(h,i) \;/\; S(h,i)]\} & \text{otherwise.} \end{cases} \quad (7)$$

Combining this result with the expected frequency of selection of the i-th FSU into the first stage sample, given by equation (5), the unconditional probability of selection of the j-th housing unit in the i-th FSU of stratum h is given by

$$P_2(h,i,j) = \begin{cases} n_1 \, P(h,i) \, S(h,i) \;/\; \sum_{h=1}^{H} \sum_{i=1}^{N(h)} S(h,i) & \text{for segments 202 and 203,} \\ n_1 n_{2P} \;/\; [\sum_{h=1}^{H} \sum_{i=1}^{N(h)} S(h,i)] \, \{\sum_{h=1}^{H} \sum_{i\varepsilon S_{1P}} [M(h,i) \;/\; S(h,i)]\} & \text{otherwise.} \end{cases} \quad (8)$$

The initial sampling weight for a household is the reciprocal of the probability of selection, given by equation (8). Hence, the initial sampling weight for the j-th sample housing unit in the i-th FSU of stratum h is given by

$$W_2(h,i,j) = \begin{cases} \sum_{h=1}^{H} \sum_{i=1}^{N(h)} S(h,i) \;/\; [n_1 \, P(h,i) \, S(h,i)] & \text{for segments 202 and 203,} \\ [\sum_{h=1}^{H} \sum_{i=1}^{N(h)} S(h,i)] \, \{\sum_{h=1}^{H} \sum_{i\varepsilon S_{1P}} [M(h,i) \;/\; S(h,i)]\} \;/\; [n_1 \, n_{2P}] & \text{otherwise.} \end{cases} \quad (9)$$

It is important to note that this initial sampling weight is identically the same for all sample housing units within segments receiving a proportional allocation of the housing unit sample. Therefore, all housing units in the Los Angeles sample have identically the same sampling weight. For the Antioch/Pittsburg sample all sample housing units except those in segments 202 and 203 receive exactly the same sampling weight. Such equally weighted samples achieve maximum possible precision for sample statistics, given other features of the sample survey design.

First Season Sample of Persons Selected for Monitoring

Data collected during the household screening interviews were used to stratify the third stage sample of individuals selected for personal exposure and body-burden monitoring. Potential for occupational exposure was used to define two explicit strata for the Phase III TEAM samples: (1) high suspected occupational exposure, and (2) low suspected occupational exposure. The person-level strata and sampling units for the the Phase III third-stage samples can be represented by the following indices:

1. Let $k = 1,2$ denote the two occupational exposure strata (1 = high, 2 = low).
2. Let $\ell = 1,2,\ldots,N(h,i,j,k)$ denote the members of stratum k for whom screening data were collected in the j-th housing unit of the i-th FSU in stratum h.

A sample of $n_3(k)$ individuals was selected from the age-eligible members of stratum k for personal exposure monitoring. This sample size was allocated to the i-th sample FSU in proportion to a measure, $S_3(h,i,k)$, of the stratum k size of the i-th FSU in stratum h. For the Los Angeles sample, this size measure was the number, $N_3(h,i,k)$, of age-eligible members of stratum k that were successfully screened in the i-th FSU of stratum h. For the Antioch/Pittsburg sample, the size measure was the weighted estimate of the number of target population members belonging to the k-th stratum of the i-th FSU in stratum h based on the housing unit weights adjusted for nonresponse. Hence, the size measure used for allocation of the stratum k sample size, $n_3(k)$, to the i-th FSU of stratum h was

$$S_3(h,i,k) = \begin{cases} N_3(h,i,k) & \text{for Los Angeles,} \\ W_5(h,i,j)\ N_3(h,i,k) & \text{for Antioch/Pittsburg,} \end{cases} \qquad (10)$$

where W_5 is defined in equation (16).

The proportional allocation of the stratum k sample size, $n_3(k)$, was randomly rounded so that the exact proportional allocation was achieved in expectation. Hence, the expected value of the number of stratum k selections, $n_3(h,i,k)$, to be allocated to the i-th FSU of stratum h was given by

$$E[n_3(h,i,k)] = n_3(k)\ S_3(h,i,k) \Big/ \sum_{h=1}^{H} \sum_{i \varepsilon S_1} S_3(h,i,k), \tag{11}$$

where S_1 is the set of FSUs in the first stage sample. The conditional probability of selection of the ℓ-th member of stratum k who belongs to the j-th housing unit in the i-th FSU of stratum h, given that the i-th FSU was in the sample (i.e., $i \varepsilon S_1$) and screening data were collected for the j-th housing unit (i.e., $j \varepsilon R_2$), is then given by

$$P_3(h,u,j,k,\ell \mid i \varepsilon S_1, j \varepsilon R_2) = E[n_3(h,i,k)]/N_3(h,i,k)$$

$$= \begin{cases} n_3(k) \Big/ \sum\limits_{h=1}^{H} \sum\limits_{i \varepsilon S_1} N_3(h,i,k) & \text{for Los Angeles,} \\ \\ n_3(k)\ W_5(h,i,j) \Big/ \sum\limits_{h=1}^{H} \sum\limits_{i \varepsilon S_1} W_5(h,i,j)\ N_3(h,i,k) & \text{for Antioch/Pittsburg.} \end{cases} \tag{12}$$

The reciprocal of the probability of selection given by equation (12) is the third stage weight component. Hence, the third stage weight component for the first season sample is given by

$$W_3(h,i,j,k,\ell \mid i \varepsilon S_1, j \varepsilon R_2) = \begin{cases} \sum\limits_{h=1}^{H} \sum\limits_{i \varepsilon S_1} N_3(h,i,k) \Big/ n_3(k) & \text{for Los Angeles,} \\ \\ \sum\limits_{h=1}^{H} \sum\limits_{i \varepsilon S_1} W_5(h,i,j)\ N_3(h,i,k) \Big/ [n_3(k)\ W_5(h,i,j)] & \text{for Antioch/Pittsburg.} \end{cases} \tag{13}$$

Since the third stage sample of people selected for personal exposure and body-burden monitoring was a subsample of the respondents to the second stage household screening survey, the initial sampling weight for the individuals selected for personal exposure monitoring is the product of the third stage weight component given by equation (13) and the second stage weight given by equation (9) after adjusting for second stage nonresponse to the household screening survey.

Second Season Sample of Persons to be Monitored

A subsample of the Los Angeles area first season respondents for whom personal exposure and body-burden data were collected was selected for a second season of personal exposure and body-burden monitoring. All 22 first season participants in the high suspected occupational exposure stratum were selected into the second season sample. For the low suspected occupational exposure stratum, a sample of size 59 was allocated to the segments in proportion to the number of first season exposure stratum participants in the segment. This proportional allocation was randomly rounded. Therefore, the exact proportional allocation could have been used as the basis for weighting the second season sample. However, this weighting procedure would have caused the estimated size of the first season target population based upon the second season sample members to differ slightly from that based upon the first season participants. Hence, the rounded second season sample allocations to the segments were used to define the second season weight components.

Given the stratum k sample size allocated to the i-th FSU of stratum h, the conditional probability of selection of the ℓ-th member of stratum k who belonged to the j-th housing unit in the i-th FSU of stratum h (given that the i-th FSU was in the sample, the j-th housing unit responded to the screening survey, and the ℓ-th individual was a first season respondent (i.e., $\ell \epsilon R_3$) is given by

$$P_4(h,i,j,k,\ell \mid i \epsilon S_1, j \epsilon R_2, k \epsilon R_3) = n_4(h,i,k) \ / \ N_4(h,i,k), \qquad (14)$$

where $n_4(h,i,k)$ = Stratum k second season sample size allocated to the i-th FSU of stratum h,

$N_4(h,i,k)$ = Total number of stratum k members of the i-th FSU of stratum h for whom personal exposure and body-burden data were collected during the first season of monitoring.

The reciprocal of the conditional probability of selection given by equation (14) is the second season weight component. Hence, the second season weight component is

$$W_4(h,i,j,k,\ell \mid i \epsilon S_1,\ j \epsilon R_2,\ \ell \epsilon R_3) = N_4(h,i,k) \ / \ n_4(h,i,k). \qquad (15)$$

of course, this second season weight component is identically unity for the high suspected occupational exposure stratum (k = 1) for which all first season participants were selected into the second season sample. Since the second season sample was a subsample of the first season participants, the initial second season sampling weight was calculated as the product of the second season weight component given by equation (15) and the nonresponse-adjusted first season weight.

ADJUSTED ANALYSIS WEIGHTS

Initial sampling weights are usually adjusted to reduce the potential bias due to nonresponse. There are two types of weight adjustment procedures that are commonly employed: (1) Post-stratification adjustments and (2) Weighting class adjustments. The properties of each of these procedures will be described briefly. Their application for TEAM nonresponse adjustments will then be discussed.

The two types of nonresponse adjustment procedures share many common features. The basic concept of each is to adjust the sampling weights of the survey respondents so that they sum to specified totals. Both procedures require that the respondents be classified uniquely into categories or cells such that the respondents are representative of the entire target population within cells with respect to survey responses and/or propensity to respond. Thus, preliminary data analysis can indicate which variables are useful for defining these cells. For person-level adjustments, the variables age, race, and sex are often useful for defining these cells. Smoking status and potential for occupational exposure may also be useful for the TEAM study.

The weight adjustment cells for both post-stratification and weighting class nonresponse adjustments are usually required to contain a minimum of 20 respondents, as a rough rule-of-thumb. This minimum number of respondents is needed because the weight adjustments use the sample members in each weight adjustment cell to estimate the number of population members in the cell. These estimates would be very unstable, which would produce unstable adjustment factors and decrease the precision of survey statistics, if smaller numbers of respondents were generally allowed to represent the weight adjustment cells.

The post-stratification adjustment of sampling weights is based upon population totals for the weighting cells or post-strata. These cell totals are assumed to be known essentially without sampling error. The sum of the unadjusted sampling weights for all sample members of a post-stratum, both responding and nonresponding, is an unbiased estimate of the number of members of the population that belong to the post-stratum. Suppose that the number of members of the population that belong to the post-stratum is, in fact, known. The idea of the post-stratification procedure is then to multiply the sampling weight of each sample respondent in the post-stratum by a common factor so that the sum of the sampling weights for the survey respondents is precisely the known number of population members belonging to the post-stratum. If the known population totals are based upon a source that has better coverage of the target population than does the sampling frame, this procedure simultaneously reduces the bias due to both undercoverage of the target population by the sampling frame and nonresponse of sample members.

The weighting-class adjustment for nonresponse is identical to the post-stratification adjustment procedure except that estimated population cell totals are used, rather than essentially known population totals. If the survey respondents and nonrespondents can both be classified into weighting-class cells, the sum of the unadjusted sampling weights for both the cell respondents and nonrespondents provides an estimate of the number of individuals in the target population that belong to the cell. This estimated post-stratum population size can then be used in place of the essentially known post-stratum size to reduce the bias resulting from nonresponse.

Nonresponse occurred at two levels for the TEAM first season samples. Some eligible housing units failed to respond to the household screener. Second, some of the individuals selected for personal exposure and body-burden monitoring did not participate. Weighting class adjustment procedures were used to compensate for household nonresponse to the screening interview and again to adjust for nonresponse of individuals selected for personal exposure and body-burden monitoring.

Household Screener Response

The total numbers of housing unit listings selected into the Phase III TEAM samples, including missed housing units, were: 1,260 for the Los Angeles study site and 604 for the Antioch/Pittsburg study site. The distribution of the final household screening status for these sample listings is presented in Table 23. Some of the sample listings were classified as ineligible due to

TABLE 23. HOUSEHOLD SCREENING RESULTS

Final Results	Frequency Los Angeles	 Antioch/Pittsburg
Ineligible Unit	41	43
Vacant	32	27
Not a Housing Unit	6	15
Temporary/Vacation Home	3	1
Eligible Unit	1219	561
Refusal	100	41
No One Home	44	17
Language Barrier	5	1
Other	7	0
Screening Completed	1063	502
TOTAL	1260	604

being vacant, nonresidential, or not a permanent residence. Household screening data were collected for 1,063 of the 1,219 eligible housing units in Los Angeles and for 502 of the 561 eligible housing units in the Antioch/Pittsburg sample. Therefore, the household response rates were 87.2 percent for the Los Angeles study area and 89.5 percent for the Antioch/Pittsburg study area.

Adjustment for Nonresponse of Households Selected for Screening

Post-stratification of the initial housing unit weights to counts of persons or housing units in the target areas based upon the 1980 Decennial Census was considered but rejected. The main reason that such post-stratification was not implemented is that the Phase III TEAM surveys were conducted four years after the Decennial Census. It is likely that the populations of the target areas, especially the Antioch/Pittsburg area, increased during those four years. Hence, the Census data could best be used as a benchmark for comparison. Moreover, the appropriate Census data are not available in published form because the definitions of the target areas were based upon Census tracts and Census blocks, not Census Places alone.

The sample segments, i.e., sample first stage units (FSUs), were defined to be weighting classes for the housing unit nonresponse adjustment. It can be seen from Tables 24 and 25 for the Los Angeles and Antioch/Pittsburg study sites, respectively, that the number of responding housing units exceeded 30 in every sample segment and the response rate varied considerably between segments. Hence, the sample segments were ideal weighting classes.

Since the initial housing unit weight given by equation (9) was identically the same for all sample housing units within a sample segment, the weight adjustment factor for each segment was simply the ratio of the number of eligible sample housing units in the segment divided by the number of responding housing units in the segment. Hence, the adjusted analysis weight for the j-th sample housing unit in the i-th FSU of stratum h is given by

$$W_5(h,i,j) = W_2(h,i,j)\ n_e(h,i)\ /\ n_r(h,i), \qquad (16)$$

where

$n_e(h,i)$ = Number of eligible sample housing units in the i-th FSU of stratum h, and

$n_r(h,i)$ = Number of responding housing units in the i-th FSU of stratum h.

The analysis weights given by equation (16) and the factors thereof are displayed in Tables 24 and 25 for the Los Angeles and Antioch/Pittsburg samples, respectively. These analysis weights should be used for all analysis of household screening data, both household-level data and person-level data. These weights were also used for development of the sampling weights for individuals selected for personal exposure and body-burden monitoring because they were necessarily selected from the members of responding households.

Response of Persons Selected for First Season Monitoring

A total of 311 people was selected for personal exposure and body-burden monitoring in the Phase III TEAM studies: 190 for the Los Angeles study area and 121 for Antioch/Pittsburg. The distribution of the final monitoring status for these sample subjects is shown in Table 26. For the purposes of computing nonresponse adjustments and response rates, all sample members are regarded as eligible for the survey except those who moved out of the target area and those who were never in the target area during the time that monitoring was conducted. The few sample members who were physically or mentally unable to participate were treated as survey-eligible so that such individuals would not be excluded from the target population. Those sample members who could not be contacted after five or more attempts were also treated as eligible for the survey because a major effort had been made to identify and properly classify individuals who were not in the target area during the monitoring phase of the study, soliciting information from neighbors if necessary.

Since personal exposure and body-burden data were collected for 117 of 182 eligible members of the Los Angeles sample and 71 of 111 eligible members of the Antioch/Pittsburg sample, the person-level response rate was 64.3 percent for Los Angeles and 64.0 percent for Antioch/Pittsburg. Multiplying these person-level response rates by the household screening response rates of 87.2 percent and 89.5 percent produces overall response rates of 56.1 percent and 57.3 percent for the Los Angeles and Antioch/Pittsburg study areas, respectively.

These response rates are reasonably good for studies that monitor personal exposure and body-burden because such studies have an unusually high respondent burden. Nonresponse produces bias in the results of monitoring studies to the extent that exposure levels are related to whether or not a

TABLE 24. WEIGHTING CLASSES FOR LOS ANGELES SCREENER WEIGHTS

Segment Number	Initial Weight[a]	Eligible Housing Units	Responding Housing Units	Adjustment Factor[b]	Final Weight[c]
101	126.052	50	42	1.1905	150.061
102	126.052	40	37	1.0811	136.272
103	126.052	49	44	1.1136	140.376
104	126.052	53	46	1.1522	145.233
105	126.052	48	45	1.0667	134.455
106	126.052	52	51	1.0196	128.523
107	126.052	49	46	1.0652	134.272
108	126.052	43	37	1.1622	146.492
109	126.052	59	52	1.1346	143.020
110	126.052	48	37	1.2973	163.526
111	126.052	48	40	1.2000	151.262
112	126.052	50	34	1.4706	185.370
113	126.052	47	37	1.2703	160.120
114	126.052	51	42	1.2143	153.063
115	126.052	49	43	1.1395	143.640
116	126.052	49	45	1.0889	137.256
117	126.052	51	44	1.1591	146.105
118	126.052	47	37	1.2703	160.120
119	126.052	46	45	1.0222	128.853
120	126.052	49	45	1.0889	137.256
121	126.052	45	44	1.0227	128.916
122	126.052	48	40	1.2000	151.262
123	126.052	48	45	1.0667	134.455
124	126.052	52	46	1.1304	142.493
125	126.052	48	39	1.2308	155.140

[a] See Equation (9).

[b] Ratio of eligible housing unit count divided by responding housing unit count.

[c] See Equation (16).

TABLE 25. WEIGHTING CLASSES FOR ANTIOCH/PITTSBURG SCREENER WEIGHTS

Segment Number	Initial Weight[a]	Eligible Housing Units	Responding Housing Units	Adjustment Factor[b]	Final Weight[c]
201	62.148	51	50	1.0200	63.391
202	72.925	75	74	1.0135	73.911
203	102.092	99	87	1.1379	116.174
204	62.148	55	48	1.1458	71.211
205	62.148	46	43	1.0698	66.484
206	62.148	47	37	1.2703	78.945
207	62.148	53	46	1.1522	71.605
208	62.148	45	43	1.0465	65.038
209	62.148	45	35	1.2857	79.904
210	62.148	45	40	1.1250	69.916

[a] See Equation (9).

[b] Ratio of eligible housing unit count divided by responding housing unit count.

[c] See Equation (16).

TABLE 26. FIRST SEASON PERSON-LEVEL SAMPLE RESULTS

Code	Final Status	Los Angeles		Antioch/Pittsburg	
		Frequency	Percent	Frequency	Percent
111	Completed study questionnaire and personal monitoring	117	61.6	71	58.7
112	Completed study questionnaire but not personal monitoring	9	4.7	11	9.1
120	Refused	46	24.2	18	14.9
130	Physically or mentally unable to participate	3	1.6	2	1.7
140	No contact after 5 or more attempts	4	2.1	6	5.0
150	Moved out of the target area	5	2.6	3	2.5
160	Moved/unable to locate	0	0.0	0	0.0
170	Out of target area during interview period	3	1.6	7	5.8
180	Other	3	1.6	3	2.5
	TOTAL	190	100.0	121	100.2

person is willing to participate in the study. Hence, the effect of high nonresponse may not be as severe for a monitoring study as it would be for a study that measures personal attitudes and opinions. Moreover, nonresponse weight adjustments reduce this potential bias to the extent that respondents and nonrespondents are more alike within weighting classes than in the overall population.

Adjustment for Nonresponse of Persons Selected for First Season Monitoring

Since the sample of persons selected for the first season of personal exposure and body-burden monitoring was a subsample of the household screener respondents, the initial sampling weights for the persons selected for personal exposure and body-burden monitoring are the product of the screener weights adjusted for household nonresponse, given by equation (16), and the person-level weight component, given by equation (13). In order to simplify the notation, the j-th housing unit in the i-th FSU of stratum h will be referred to henceforth as the hij-th housing unit. Likewise, the ℓ-th sample subject selected from person-level stratum k will be referred to as the kℓ-th sample subject. Hence the initial sampling weight for the kℓ-th sample subject selected from the hij-th housing unit can be expressed as

$$W_6(hij,k\ell) = \begin{cases} W_5(h,i,j) \sum_{h=1}^{H} \sum_{i \varepsilon S_1} N_3(h,i,k) \,/\, n_3(k) & \text{for Los Angeles,} \\ \sum_{h=1}^{H} \sum_{i \varepsilon S_1} W_5(h,i,j)\, N_3(h,i,k) \,/\, n_3(k) & \text{for Antioch/Pittsburg,} \end{cases} \qquad (17)$$

from equations (13) and (16). The advantage of the sample size allocation procedure used for the Antioch/Pittsburg study area is apparent in this result. In particular, there are only two distinct initial person-level sampling weights for the Antioch/Pittsburg sample: one for the high suspected occupational exposure stratum (k=1) and one for the low suspected occupational exposure stratum (k=2). The initial person-level weights for the Los Angeles sample are nonetheless approximately equal within each stratum. The final person-level analysis weights were computed by adjusting the initial weights given by equation (14) to compensate for the potential bias due to nonresponse of individuals selected for monitoring.

Because of the nature of the definition of the target population for the TEAM Phase III studies, it was not possible to obtain an independent estimate of the population size, e.g., from the U.S. Bureau of the Census. Hence, a weighting class nonresponse adjustment procedure was used instead of post-stratification. Use of weighting class adjustment procedures requires that every respondent and nonrespondent be classified into a unique weighting class. The population members of a weighting class should be relatively homogeneous with respect to response variables and/or propensity to respond. Moreover, each weighting class should generally contain 20 or more respondents. These criteria were used to define first season nonresponse weighting classes shown in Tables 27 and 28 for the Los Angeles and Antioch/Pittsburg study areas, respectively.

Response rate differentials were considered for many potential weighting classes based upon suspected occupational exposure, first stage geographic strata, respondent age, and respondent sex. The weighting classes shown in Tables 27 and 28 were chosen to maximize the response rate differential between strata subject to the constraint of having at least 20 respondents per weighting class. In general, the index r, where

$$r = 1,2,\ldots,R,$$

will be used to denote the weighting classes for each sample site (R=5 for the Los Angeles study site; R=3 for the Antioch/Pittsburg study site).

Computation of the weighting class nonresponse adjustment factors was facilitated by defining indicators of response and eligibility status for all sample members. These indicators were defined in terms of the Final Status Coded (FSCs) shown in Table 26 for the first season samples. The indicator of respondents for whom both personal exposure and body-burden data were collected was defined for the kℓ-th sample member from the hij-th housing unit as follows:

$$I_{R_{31}}(hij,k\ell) = \begin{cases} 1 \text{ if FSC} = 111 \text{ for the } k\ell\text{-th person,} \\ 0 \text{ otherwise.} \end{cases} \qquad (18)$$

Analyses that involve only questionnaire data can be based on the larger set of all sample members who responded to the study questionnaire, irrespective of whether or not monitoring data were successfully collected. The indicator variable that identifies all respondents for whom questionnaire data were

TABLE 27. WEIGHTING CLASSES FOR FIRST SEASON LOS ANGELES NONRESPONSE ADJUSTMENT

Weighting Class	EXPOSE	First Stage Strata	Age	Sex	Sample Size	Number of Respondents	Weight Adjustment Factor[a]
1	High	All	7+	All	40	22	1.7695
2	Low	211, 212 222, 223	7-39	Male	28	23	1.0878
3	Low	211, 212 222, 223	7-39	Female	28	21	1.4398
4	Low	211, 212 222, 223	40+	All	40	20	1.8272
5	Low	231, 232	All	All	54	31	1.6864

[a] $A_{31}(r)$ in Equation (22).

TABLE 28. WEIGHTING CLASSES FOR ANTIOCH/PITTSBURG NONRESPONSE ADJUSTMENT

Weighting Class	EXPOSE	Age	Sample Size	Number of Repondents	Weight Adjustment Factor[a]
1	High	7+	40	22	1.6818
2	Low	7-29	41	26	1.4231
3	Low	30+	40	23	1.6087

[a] $A_{31}(r)$ in Equation (22).

collected was defined for the kℓ-th sample member from the hij-th housing unit as

$$I_{R_{32}}(hij,k\ell) = \begin{cases} 1 \text{ if FSC} = 111 \text{ or } 112 \text{ for the } k\ell\text{-th person,} \\ 0 \text{ otherwise.} \end{cases} \quad (19)$$

As discussed earlier, sample members who had moved out of the target area or were never in the target area during the time period when monitoring was being conducted were classified as ineligible for the study because they were no longer target population members. All other sample members were treated as survey-eligible for computation of nonresponse adjustments and response rates. The indicator of eligible sample members was defined for the kℓ-th sample member from the hij-th housing unit as follows:

$$I_E(hij,k\ell) = \begin{cases} 1 \text{ if FSC} \neq 150, 160, \text{ or } 170 \text{ for the } k\ell\text{-th person,} \\ 0 \text{ otherwise.} \end{cases} \quad (20)$$

The weighting class nonresponse adjustment procedure ratio adjusts the weights of the sample respondents so that they sum to a sample estimate of the number of population members in each weighting class. For the Phase II first season TEAM samples the number of population members belonging to weighting class r was estimated as

$$\hat{N}(r) = \Sigma_r W_6(hij,k\ell)\ I_E(hij,k\ell), \quad (21)$$

where Σ_r denotes summation over all sample members who belong to the r-th weighting class, and W_6 is the initial weight for sample members given by equation (17).

The weighting class ratio adjustment factor was computed for the participants for whom personal exposure and body-burden data were collected as follows:

$$A_{31}(r) = \hat{N}(r) \ / \ [\Sigma_r W_6(hij,k\ell)\ I_{R_{31}}(hij,k\ell)]. \quad (22)$$

Likewise, for all participants for whom study questionnaire data were collected, the weighting class ratio adjustment factor was computed as

$$A_{32}(r) = \hat{N}(r) \ / \ [\Sigma_r W_6(hij,k\ell)\ I_{R_{32}}(hij,k\ell)]. \quad (23)$$

In each case, the symbol "Σ_r" denotes summation over all sample members who belong to weighting class r. Examination of these weight adjustment factors in Tables 27 and 28 reveals that nonresponse was greatest among the elderly and those people in the high suspected occupational exposure stratum.

The weight adjustment factors (22) and (23) were multiplied by the initial weights given by equation (17) to obtain the analysis weights adjusted for nonresponse and ineligibility. The adjusted weights for the kℓ-th sample member from the hij-th housing unit are defined by

$$W_{71}(hij,k\ell,r) = \begin{cases} W_6(hij,k\ell)\ A_{31}(r) & \text{if } k\ell \varepsilon R_{31}, \\ 0 & \text{otherwise,} \end{cases} \qquad (24)$$

$$W_{72}(hij,k\ell,r) = \begin{cases} W_6(hij,k\ell)\ A_{32}(r) & \text{if } k\ell \varepsilon R_{32}, \\ 0 & \text{otherwise,} \end{cases} \qquad (25)$$

where R_{31} is the set of participants for whom personal exposure and body burden data were collected and R_{32} is the set of all participants for whom questionnaire data were collected. The summation of each set of adjusted analysis weights, W_{71} and W_{72}, over all sample members who belong to weighting class r is, by definition, the estimated population total, $\hat{N}(r)$, for that weighting class.

Truncation and Smoothing of First Season Weights

After all nonresponse adjustments have been applied to any set of sampling weights, a few adjusted weights are sometimes much larger than all the others. The presence of a few extremely large analysis weights can substantially increase sampling variances and decrease precision of estimates. Hence, when there are a few outlier weights, these weights are sometimes truncated (i.e., reduced to a value more comparable to the rest of the weights). The truncation is usually performed to reduce only the effect of unequal weighting resulting from nonresponse adjustments, not that resulting from unequal sample selection probabilities. Finally, truncated weights must be smoothed (ratio adjusted) within weighting classes so that the final weights sum to the same estimated population totals as the adjusted analysis weights.

The distributions of the adjusted first season person-level weights, W_{71} and W_{72}, were examined with regard to the potential need for weight truncation for each Phase III TEAM sample. One statistic that is often used to measure the loss in precision due to the presence of unusually large weights is the estimated design effect due to unequal weighting. The design effect for an estimate is defined as the ratio of the variance of that estimate for the design employed divided by an estimate of the variance that would have been achieved by a simple random sample of the same size. The estimated design effect due to unequal weighting is typically calculated as

$$DEFF = \Sigma W^2 / [n (\Sigma W)^2], \qquad (26)$$

where W is the analysis weight and n is the number of positive weights in the summation. The estimated design effect due to unequal weighting was calculated for each Phase III sample.

The estimated unequal weighting design effects for the person-level analysis weights, W_{71}, were quite small: 1.11 for the Los Angeles area sample and 1.17 for the Antioch/Pittsburg sample. These samples were specifically designed to produce nearly equal analysis weights, and no weight truncation was needed. Therefore, the adjusted analysis weights, W_{71} and W_{72}, are the final person-level analysis weights for the first season samples. The weight W_{71} is used for analyses based on those sample members for whom personal exposure and body-burden data were collected. For those analyses based entirely on the study questionnaire data, the analysis weight W_{72} may be used; all participants who provided study questionnaire data, including those for whom personal exposure data were not collected, would then be used in the analyses.

The final Los Angeles weights depended upon both the sample segment (i) and the weighting class (r). However, there were only three distinct final weights for the Antioch/Pittsburg sample; one for each weighting class (r). The overall unequal weighting design effect was slightly greater, however, for the Antioch/Pittsburg sample because of a higher rate of oversampling for the Antioch/Pittsburg high suspected occupational exposure stratum. This higher oversampling rate was a direct consequence of the relatively smaller size of the Antioch/Pittsburg household screening sample.

Response of Persons Selected for Second Season Exposure Monitoring

A sample of 81 first season participants for whom personal exposure and body-burden data were collected was selected for a second season of monitoring in the Los Angeles study area. The distribution of final monitoring status for the second season sample members is shown in Table 29. For the purposes of computing nonresponse adjustments and response rates, all sample members are regarded as eligible for the survey except those who moved out of the target area and those who were never in the target area during the time period when second season monitoring was being conducted.

Personal exposure and body-burden data were collected for 52 of the 76 eligible sample members, which yields a person-level response rate of 68.4 percent for the second season of monitoring. Multiplying this second season person-level response rate by the overall first season response rate of 56.1 percent for the Los Angeles study area produces an overall second season response rate of 38.4 percent.

Adjustment for Nonresponse of Persons Selected for Second Season Monitoring

Since the second season sample of persons selected for personal exposure body-burden monitoring was a subsample of the Los Angeles study first season participants, the initial second season weight was calculated as the product of the first season weight adjusted for nonresponse and the second season weight component, given by equation (15). However, the second season sample for the low suspected occupational exposure stratum was allocated to the segments in proportion to the number of age-eligible members of the stratum that were screened in each segment. As a result, variability in the initial second season weights for this stratum were minimized by using segments as first season weighting classes, rather than the weighting classes shown in Table 27. Using segments as weighting classes was advantageous for reducing nonresponse bias, also, because the response rate varied considerably between segments.

Hence, for members of the low suspected occupational exposure stratum, a special-purpose, nonresponse-adjusted, first season weight was computed. The only purpose of this weight was to enable computation of more appropriate and less variable initial second season sampling weights. These special-purpose weights were computed exactly as described above, except that the weighting classes were indexed by r', where

$$r' = 1, 2, \ldots, 25,$$

indexes the sample segments. Hence, the special purpose first season adjusted weight for the $k\ell$-th sample member from the hij-th housing unit can be expressed as

TABLE 29. SECOND SEASON PERSON-LEVEL SAMPLE RESULTS

Code	Final Status	Frequency	Percent
111	Completed personal exposure monitoring	52	64.2
112	Broke appointment for personal exposure monitoring	3	3.7
120	Refused	10	12.3
130	Physically or mentally unable to participate	4	4.9
140	No contact after 5 or more attempts	2	2.5
150	Moved out of the target area	4	4.9
160	Moved/unable to locate	0	0.0
170	Out of target area during interview period	1	1.2
180	Other[a]	5	6.2
TOTAL		81	99.9

[a] Includes three sample members who were willing to participate, but personal exposure monitoring data could not be collected because all Tenax cartridges had been used.

$$W_8(hij,k\ell,r') = \begin{cases} W_6(hij,k\ell)\ A_{31}(r') \text{ if } k\ell \varepsilon R_{31} \text{ and EXPOSE=2} \\ 0 \qquad \text{otherwise} \end{cases} \tag{27}$$

where $A_{31}(r')$ is defined exactly shown in Equation (22) except that each summation, Σ_r, over members of the r-th weighting class is replaced by the summation, $\Sigma_{r'}$, over members of weighting class r'.

Hence, the initial second season sampling weight for the kℓ-th sample member selected from the hij-th housing unit is given by

$$W_9(hij,k\ell,r') = \begin{cases} W_{71}(hij,k\ell,1) & \text{if EXPOSE=1,} \\ W_8(hij,k\ell,r')\ N_4(h,i,k)\ /\ n_4(h,i,k) & \text{if EXPOSE=2,} \end{cases} \tag{28}$$

where W_{71} and W_8 are the adjusted first season weights given by equations (24) and (27), respectively.

The initial second season sampling weight, W_9, was adjusted for nonresponse and ineligibility of members of the second season sample in exactly the same way that the initial first season weight, W_6, was adjusted to produce the adjusted weight variable, W_{71}. Only the definition of the weighting classes had to be revised for application of this procedure to the second season weights.

The second season weighting classes were defined by the two levels of suspected occupational exposure, as shown in Table 30. Let the index s, where

$$s = 1,2,$$

denote the second season weighting classes. The second season person-level adjusted weights for the kℓ-th sample member from the hij-th housing unit can then be expressed as

$$W_{10}(hij,k\ell,r',s) = \begin{cases} W_9(hij,k\ell,r')\ A_{31}(s) \text{ if } k\ell \varepsilon R_4, \\ 0 \qquad \text{otherwise,} \end{cases} \tag{29}$$

where R_4 denotes the set of second season participants, and the weight adjustment factor, $A_{31}(s)$, is defined exactly as shown in equation (22) except that each summation, Σ_r, over members of the r-th weighting class is replaced by the summation, Σ_s, over members of weighting class s.

Truncation and Smoothing of Second Season Weights

The distributions of the adjusted second season weights, W_{10}, were examined for the two second season weighting classes, high and low suspected

TABLE 30. WEIGHTING CLASSES FOR SECOND SEASON NONRESPONSE ADJUSTMENT

EXPOSE	Sample Size	Number of Respondents	Weight Adjustment Factor[a]
High	22	15	1.4375
Low	59	37	1.4665
TOTAL	81	52	

[a] $A_{31}(s)$ in Equation (29).

occupational exposure. Based upon this investigation, it appeared that truncation of the second season weights would not be appropriate. The estimated unequal weighting design effect for the second season sample was 1.25. Hence, the adjusted analysis weights, W_{10}, given by equation (29) are the final analysis weights for the second season sample.

QUALITY ASSURANCE FOR SAMPLING WEIGHTS AND DESIGN

All sampling weight files produced by RTI's Center for Survey Statistics (CSS) are routinely subjected to a prescribed regimen of quality assurance checks. These quality assurance checks have been performed for all the Phase III TEAM sampling weights. These quality assurance checks have been reviewed by a senior member of the CSS staff, and the weights have been approved for release to the EPA for analyses.

A copy of the Quality Assurance Check List that was used as the basis for these quality assurance checks is reproduced in Appendix C. The weight checks primarily test for agreement of certain weight totals from one stage of sampling to the next stage of sampling and from sampling weights to nonresponse-adjusted weights.

Unfortunately, there are many ways that errors can be made in computation of the weights that can go undetected when these quality assurance checks are applied, especially with regard to the initial sampling weights. Most notably, some types of computer programming errors are difficult to detect. After the Phase III TEAM sampling weights were initially computed, some computer programming errors were detected and corrected. These errors were not detected by the standard quality assurance checks. Instead, they were usually detected when the weight computations were being reviewed in detail for documentation purposes.

Appendix D provides further documentation on sampling design.

VARIANCE ESTIMATION

The sampling design for each Phase III first season TEAM target area was a stratified three-stage design. Geographic area segments were selected with replacement at the first stage of selection using probabilities proportional to the Decennial Census housing unit count. Clusters of housing units were selected at the second stage and screening data were collected for all members of responding households. Finally, a stratified sample of individuals was selected for personal exposure and body-burden monitoring at the third stage. The stratum sample sizes for the third stage sample of individuals was specifically allocated to the sampled first stage units, an independent samples were selected within the first stage units. Hence, the survey design was a completely nested design. The sample survey design was completely nested to facilitate use of the usual sample survey variance formulas that assume a nested design and with-replacement sampling at the first stage.

The usual variance estimation formulas that assume nested design and with-replacement sampling at the first stage have been used to compute sampling variances for all Phase III TEAM samples. The sampling variances are based upon the variability between first stage units (FSUs) within strata. The FSUs for each Phase III sample were selected from an ordered samling frame using a sequential, minimum probability replacement sampling technique (1,2). Six explicit first stage strata were used for the Los Angeles study area, and four explicit strata were used for the Antioch/Pittsburg study area as shown in Table 23. Hence, estimates of sample precision (variances and standard errors) were computed from differences between first stage sampling units within first stage strata. RTI's special-purpose software for estimating the sampling variances of statistics calculated from complex sample survey data was used to perform these computation (3,4). This software computes estimated sampling variances using the Taylor Series linearization method (5) assuming a nested design and sampling with replacement at the first stage.

SECTION 5

SURVEY OPERATIONS

INTRODUCTION

This chapter describes the survey operation activites, both onsite and offsite, before, during, and after all phase of field activities associated with the Total Expense Assessment Methodology (TEAM) Study in California. These activities took place in the fall of 1983 and into the Winter and Spring of 1984, and involved activities in two sites; Los Angeles County, and Contra Costa County. As was the case in the previous phase of this study, reported elsewhere, the study involved the collection of environmental and biological specimens, and questionnaire data from random samples of individuals in order to investigate exposure to various chemicals found in the environment, subsequent body burden of these chemicals and any relationship between these levels. This report discusses the various activities undertaken during this study, and includes variations in process. The activites which occurred before field data collection included selection of the areas to be studied and revision of data collection instruments and training materials. Field activities included recruiting, hiring, and training of field interviewing staffs, counting and listing of selected segments, completing of household screening, and accomplishing field survey data collection. The field activites were followed by the standard in-house activities at RTI, which included data receipt, editing and coding, data entry, data validation, dealing with refusals, and monitoring field survey activities. Details of all activities are provided in the following sections.

Los Angeles County - Season One

In-House Activities--

This section describes in-house activities that were performed in the Fall of 1983 as preparation for, and in support of, field survey activities.

All forms, questionnaires and letters necessary for the conduct of the TEAM Study were written, reviewed, finalized and duplicated prior to the start of data collection. Copies of these survey instruments are included as Appendix E. Revisions of survey instruments and the submission of the required OMB materials were completed prior to the beginning of work on this phase of the study. Also, documentation and approval by the RTI Human Rights Committee is given in Appendix F.

The Field Interviewer's Training Manual was completed on December 9, 1983, and distributed to the TEAM Study Field Interviewers at the beginning of field training on December 12, 1983. This manual provided a complete, comprehensive set of field procedures to be followed by the field staff. A copy of the Table of Contents of the manual is displayed in Appendix G.

During household screening, biweekly reports were prepared to show the current status of household screening. These reports were made possible through regular contacts with the Field Interviewers by the local Field Supervisor. Once gathered by the local Field Supervisor, this information on the status of each segment being worked was compiled by interviewer and was provided to the survey operations Survey Manager for review on a regular basis. The status reports enabled RTI study personnel to monitor and support the effort being made by the Field Interviewers.

During December, other activites were undertaken to prepare for the subsequent phases of field survey efforts. These activities included final revision and duplication of documents, preparation of a Spanish translation of the Consent form, and discussion with other project staff of the field support needed in the next phase.

Field Activities--

Field activities for the TEAM Study in the Los Angeles, California area (Torrance, etc.) began in November 1983.

Preparatory Activities--As RTI's permanent Field Supervisor in the Los Angeles area, Mr. Durham was contacted and requested to recruit and retain a Field Interviewer staff. Two Field Interviewers were hired immediately to assist in conducting the counting and listing activities; eight Field Interviewers were retained for the conduct of the household screening phase of the field data collection. Shortly after being hired, one Field Interviewer resigned. A replacement, however, was found immediately and was retained. All field personnel being used in the Los Angeles area were experienced, professional Field Interviewers who had worked on numerous studies for RTI and for other survey research organizations.

On November 17, 1983 RTI's survey statisticians forwarded to survey operations personnel materials necessary for the completion of counting and listing in the Los Angeles area. The materials for each of the twenty-five selected segments included a Segment Sketch and an Area Map. List of Housing Units forms, List Unit Information Sheets, and miscellaneous supplies (pencils, clipboards, etc.) were added to these materials by survey research personnel. After a careful review, these materials were forwarded to the local Field Supervisor for distribution to the Field Interviewers. Prior to the start of counting and listing, the Field Supervisor conducted a thorough review of general and project specific counting and listing procedures with the two Field Interviewers who assisted him.

Counting and listing began on November 20th and was completed by November 26. There were no major problems during this phase of data collection. On November 30th, all counting and listing materials were received at RTI, and after a thorough check for completeness and accuracy, were forward to survey operations personnel for the selection of Sample Housing Units.

Field verification of counting and listing was completed by the Field Supervisor, and included the following procedures: 1) the first segment that was counted and listed was completed as a team by the Field Supervisor and two Field Interviewers. The work of the Field Interviewers during this exercise was excellent; 2) the first segment completed independently by each Field Interviewer was counted and listed again by the Field Supervisor. No errors were found; 3) All additional segments were done independently with a thorough review of materials by the Field Supervisor before they were submitted to RTI.

Field Interviewing Training--Formal Field Interviewer training was conducted by the survey operations Survey Manager, in Los Angeles on December 12 and 13, 1983 with the Field Supervisors assistance. During the training sessions, all aspects of field survey data collection were covered. In addition, the Field Interviewers were required to participate in mock interviews and training exercises to become familiar with the various situations that they might encounter. All Field Interviewers attended the training and at its completion felt comfortable with all aspects of survey data collection. At the conclusion of training, the Field Interviewers were given their household screening assignments. Assignments were made based on segment size, location, and language capabilities of the Interviewers.

On the afternoon of the second day of training, the Field Interviewers were divided into two groups, led by the trainers, and began household screening. During this less formal training period, the Field Interviewers were observed conducting household screening, and were provided with immediate feedback. The Field Interviewers were thus able to further refine their household screening skills and to develop uniformity.

Press Conference--On December 16, 1983, the Survey Operations Manager and the EPA Project Officer participated in a press conference held in Torrance, California. The local press and city managers from the cities and towns where the TEAM study was conducted were invited to attend. The purpose of the press conference was to inform the local population about the intent of the study and the field procedures involved. It was further hoped that this press conference would enhance the acceptance of the study and the eventual response rate. A copy of materials provided to the press is attached as Appendix F.

Household Screening--Household Screening began on December 14, 1983, and progressed through the end of 1983 without any major problems.

Household Screening continued during January. Progress reports continued to be taken twice a week. The final report was received on January 16th and reflected final activities for the screening phase. A copy of the summary of the final report is provided in Figure 6. Since the final response was not as good as expected, conversations were held with one of RTI's permanent Field Supervisors who has had traditionally good success with telephone conversion of refusal cases. Photocopies of refusal cases and other nonresponses were sent to her for a final attempt. This activity yielded 20 additional completed cases.

A 12% sample was selected by survey operations personnel for verification of household screening. All verifications were conducted by the Field Supervisor, and no errors or irregularities were discovered.

CATEGORY	REPORT as of DATE								
	12/18/83	12/21/83	12/25/83	12/28/83	01/01/84	01/04/84	01/08/84	01/11/84	01/14/84
1. SEGMENT STATUS									
a.Assigned	25	25	25	25	25	25	25	25	25
b.Complete	0	0	0	0	0	1	5	11	25
c.In Progress	25	25	25	25	25	24	20	14	0
2. ASSIGNMENT STATUS									
a.Prelisted SHUs	1250	1250	1250	1250	1250	1250	1250	1250	1250
b.SHUs Added	6	7	7	9	10	10	10	10	10
c.Total SHUs (a+b)	1256	1257	1257	1259	1260	1260	1260	1260	1260
3. SCREENING STATUS									
a.No Action Taken	554	192	121	35	0	0	0	0	0
b.In Progress	409	622	608	588	462	369	218	83	0
c.Complete	293	439	528	667	798	891	1042	1177	1260
d.Results of Completed HSQs:									
01 - Vacant	5	10	12	14	21	26	30	29	28
02 - Not an HU	2	3	4	4	4	5	5	5	5
03 - Temporary/vacation	0	0	0	2	0	0	0	1	1
04 - Refusal	0	0	0	2	2	28	18	97	119
05 - No One At Home	0	0	0	0	0	0	4	19	48
06 - No Eligible Resp.	0	0	0	0	0	0	0	0	0
07 - Language Barrier	0	0	0	0	0	3	5	5	4
08 - Other	0	0	0	0	0	0	0	1	5
09 - Screening complete	286	426	512	645	771	829	980	1020	1050
Total (must equal 3.c)	293	439	528	667	798	891	1042	1177	1260

Figure 6. Summary of Household Screening Report for Torrance, CA and vicinity at conclusion of primary field screening activities.

Field Activities

The primary field activity during January was the completion of the household screening. All activities were completed by the fifteenth with all segment material provided to the Field Supervisor by the next day. Before cases were designated as final, certain minimal requirements were met. These included attempts by the supervisor, or another interviewer to convert refusals, at least six attempts to contact chronic not-at-homes, and reassignment of cases to other interviewers with language skills necessary to deal with non-English speaking households. The field supervisor was required to complete a random sample validation set, as well as validating any case finalized as out of sample. These validations were completed and the forms are stored in CSR by segment.

An additional activity undertaken during this period was the receipt and processing of all screening data. As each batch was received, it was checked for completeness and the various components of the segment package separated. The segment maps and listing material were placed in file folders along with the validation forms. The screeners were batched with the original copy of the Segment Summary/Batch Header Sheet used as the batch control document. The second copy of this form was placed in the segment folder and updated as events occurred and were recorded on the original. All screeners were edited for completeness and legibility by survey operations staff and then given to survey statisticians for review. After this review, batches were delivered to Data Entry for processing. Prior to the delivery of the first batches, a test keying was held to use real data to check the programming. After one slight modification, training was held for the keying staff and work begun. All data was 100% key verified and a data file produced for the next phase of sampling. After keying, all batches were returned to survey research personnel for storage.

After the sample was selected by the sampling statistician, the "EPA signed" lead letter was mailed, and sample assignments prepared for delivery to the field concurrent with the retraining session. The sample was allocated to interviewers by segment, with segments grouped by clustering, proximity to interviewer's residence, and by previous assignment to interviewer.

During February 1984, survey research staff were involved in training and supporting the survey field staff in the completion of the second phase of field activities, the field survey data collection. A training session was held for the six interviewers retained from the first phase, and was used to review all aspects of the work to be undertaken and to distribute the assignments. The initial distribution of 175 cases was made after the training session on Thursday, February 2 and the interviewers were instructed to begin immediately. Each interviewer was assigned specific days on which to schedule appointments for environmental and biological sampling. The first day was Monday, February 6 and the last appointments began on Wednesday, February 29. Status reports were taken twice a week by the on-site supervisor and summarized and reported to survey research staff. Figure 7 displays a summary of field survey activities for the entire period. A random sample of cases was designated for early completion, and based on the results for these cases, a supplemental batch of 15 cases was fielded on February 19th. All non-interview cases were returned to the supervisor for validation, or attempts at conversions of refusals. All post-appointment field refusals were also reworked by the supervisor. Case control sheets, displaying assignment activity and validations were returned to the field supervisor for review and return to the survey research staff.

All questionnaires from the 117 Los Angeles Season I respondents were returned to survey research staff by the analytical chemistry Site Administrator's. As groups of forms were received, the forms were scan-edited for completeness, legibility, and consistency of dates and Participant ID numbers. All consent forms were placed in locked storage in the survey director's office. The Study Questionnaries and Exposure/Activity Screeners were grouped into batches of 30 and Batch Header Sheets were created. Batch numbers were assigned and entered into the automated data control system, along with the date of the data receipt.

Los Angeles - Season Two

During the Spring and Summer of 1984, planning and implementation of activities for a second season visit to Los Angeles respondents were intermixed with activites involved with sampling in a second California site (Contra Costa County). This section describes survey activites in Los Angeles, while the next section describes Contra Costa County activities.

```
REPORT NAME: FIELD STATUS SUMMARY REPORT - FILE NAME:FDCSTAT1
CREATED BY: H. ZELON
CREATED: FEBRUARY,1984

*******************************************************************************************::
REPORTING CATEGORY        :                            REPORT DATE (AS OF)            :: FINAL ::
**************************:****************************************************************::
                          :  2/5/84   2/8/84  2/12/84  2/15/84  2/19/84  2/22/84  2/26/84:: 2/29/84::
**************************:****************************************************************::
A. ASSIGNMENT             :                                                              ::        ::
 1.INITIAL CASES          :     175      175      175      175      175      175      175::     175::
 2.CASES IN               :       1        1        1        1       16       16       16::      16::
 3.CASES OUT              :       1        1        1        1        1        1        1::       1::
 4.TOTAL ASSIGNMENT       :     175      175      175      175      190      190      190::     190::
**************************:****************************************************************::
B. PENDING CASES          :                                                              ::        ::
 00.NOT ATTEMPTED         :      51        7        0        0        2        0        0::       0::
 01.APPT. MADE FOR INT.   :       7       11       13        9        8        6        0::       0::
 02.REFUSAL               :      10       18       18       19       22       13        3::       0::
 03.NO CONTACT            :      58       56       29       14       15        5        5::       0::
 04.OTHER                 :      15       16       14       10        6        3        2::       0::
    TOTAL                        141      108       74       52       54       27       10::       0::
**************************:****************************************************************::
C.FINAL INTERVIEW STATUS  :                                                              ::        ::
 11.COMPLETED INTERVIEW   :      31       56       81       96      108      120      126::     126::
 12.REFUSAL               :       0        5       11       17       18       32       42::      46::
 13.PERMANENT INCAPACITY  :       1        2        2        3        3        3        3::       3::
 14.NO CONTACT,>5 VISITS  :       0        0        0        0        0        0        0::       4::
 15.MOVED-OUT OF AREA     :       2        3        4        4        4        5        5::       5::
 16.MOVED-CAN'T LOCATE    :       0        0        0        0        0        0       40::       0::
 17.NOT AT HOME ALL FDC   :       0        1        2        2        2        2        3::       3::
 18.OTHER                 :       0        0        0        1        1        1        1::       3::
**************************:****************************************************************::
D. TOTAL(B+C=A4)          :     175      175      175      175      190      190      190::     190::
**************************:****************************************************************::
E. FINAL STATUS           :                                                              ::        ::
 I. COMPLETE              :       0        0        0       43    +++++    +++++       94::     117::
 II. FIELD REFUSAL        :       0        0        0        1    +++++    +++++        5::       6::
 III. OTHER               :       0        0        0        0    +++++    +++++        3::       3::
**************************:****************************************************************::
**************************:****************************************************************::
```

Figure 7. Summary of field survey activities.

The sampling statisticians provided a sample of Los Angeles, Season I respondents for recontact for enrollment into Season II. A letter (Figure 8) was sent to each of these respondents requesting they call RTI (toll-free) and schedule an appointment. By the end of April, twenty-five out of sixty-five selected had called in. Twenty-two had scheduled appointments, while the other three were refusals due to medical problems. All remaining cases were contacted by phone or in person to complete the scheduling for the late May sampling.

During early May, the unscheduled or no-contact cases were sent to the local field supervisor, who attempted to contact all the cases not responding to the initial mailing and for whom a telephone number was available. After completing this activity, the remaining cases were assigned to two field interviewers for in-person contacts. Based on interim, semiweekly, progress reports, the original sample of 65 cases was not going to yield the desired 50 respondents. A supplemental sample of 16 cases was selected and was sent to the local field supervisor, along with telephone numbers and times of initial contacts. These cases were also worked by telephone first, and then no-contact, or no-phone number cases were given to the field interviewers. The field staff was instructed to work all cases to completion, and that more than fifty respondents could be scheduled. The overscheduling was to allow for field refusals and to provide extra samples. The appointments for second season respondents began on May 21 and continued through early June.

All field survey activities in the Los Angeles area were completed by June 3.

As all data was received from the field, the various documents were separated, scanned for completeness, and batched for further processing. Consent forms and incentive receipts were delivered to the survey director's office for immediate secured storage. The Study Questionnarie and Exposure/Activities Screener were then sent for complete edit and coding, and were prepared for delivery to Data Entry.

Contra Costa County

At the same time as activites in Los Angeles were being conducted, activities in Contra Costa County were underway with environmental and biological

March 30, 1984

I would like to express my thanks to you for your cooperation in the TEAM Study during the first round of data collection in the Los Angeles area. As was explained to you during your initial participation in this important EPA-sponsored study, a small portion of respondents in the first round were to be selected to participate again. You are among this randomly selected group.

Your participation during this second phase will be similar to the first phase. You will be visited three times (evening, morning, and afternoon) by the chemistry team, and will be asked to wear the same air sampling devices, and to provide water and breath samples, as before. You will be asked to provide information for only one questionnaire; the one administered by the chemists at the end of the twenty-four hours of monitoring. You will once again receive the fifteen dollar incentive payment as an expression of our thanks.

While your continued participation remains voluntary, your willingness to cooperate during this second round of the study is important. The data that we collect will allow us to explore changes in potential exposure as they relate to changes in weather condition over time. We will be in Los Angeles collecting data during the last two weeks in April, starting on April 16th. To schedule an appointment for your participation, please call RTI's toll-free number 1-800-334-8571 and ask to speak to me; I will schedule your appointments and answer any questions you may have. If for some reason you are unable to participate, please call me at the number shown above so that you will not be contacted on further occasions.

Once again, thanks for your continued cooperation, and I look forward to speaking to you during the next few days.

Sincerely,

Harvey S. Zelon

Harvey S. Zelon
Study Field Director

HSZ:sbf

Figure 8. Letter sent to first season respondents.

sampling scheduled to be done immediately after activities were completed in Los Angeles.

Segment materials for the ten Contra Costa sounty Segments were provided to survey research staff by the sampling statisticians. This material was sent to the California area Field Supervisor who traveled to Contra Costa to supervise the count and list process. During the same week, he interviewed and hired the interviewing staff to be used in the screening and main phases of the study. Count and list material were returned to survey research personnel, reviewed and provided to the statisticians. After the screening sample was created, and labels were generated, the material was returned to survey research staff for use in the field.

During the last week in March, the five field interviewers retained in Contra Costa, were trained by the survey field director, who also supervised their initial efforts. While in California, he also participated in the local press conference held to coincide with the initiation of the screening phase.

During the first two weeks of April, the five field interviewers completed the household screening in the 10 segments selected in Contra Costa County. Figure 9 displays progress by reporting period, and the final status. A final response rate of 89.5% was obtained, calculated by dividing the number of completed screeners (502) by the number eligible for screening (561).

After the screening was complete, all forms were shipped to RTI and the data receipt and preparation process begun. All segment materials and screeners were logged-in and batched. Documentation of all processes undertaken was begun. All survey data collected were reconciled against expectations and were edited. These edited data were sent to the statisticians for review and then sent for data entry. All validations, comprising both the designated sample, and all sample drops, were completed by survey research staff with no abnormalities noted.

Activities for Contra Costa County during May consisted of receiving the sample material from CSS, preparing and mailing the lead letter, and preparing the field assignments and other training material. The five interviewers used during the screening process were recontacted and four were available to participate in the next phase. One of the four later became unavailable. Plans were made for a training session on June 4 in Concord, CA.

```
##########################################################################################
   'Summary'               ::
                           ::       TOTAL AS/OF
   Report Category         ::________________________________________________________________
                           ::3/28/84  4/1/84   4/4/84   4/8/84   4/11/84  4/12/84        FINAL TOT
##########################################################################################
1. Segment Status          ::
 a.Segments Assigned       ::     10       10       10       10       10       10              10
 b.Segments in Progress    ::      7       10       10        7        6        0               0
 c.Segments Completed      ::      0        0        0        3        4       10              10
##########################################################################################
2. Assignment Status       ::
 a.Pre-listed SHUs         ::    600      600      600      600      600      600             600
 b.SHUs Added This Week    ::      3        1        0        0        0        0               0
 c.SHUs Added To Date      ::      3        4        3        3        4        4               4
 d.Total SHUs (a+c)        ::    603      604      603      603      604      604             604
##########################################################################################
3. Screening Status        ::
 a.No Action Taken         ::    250        0        0        0        0        0               0
 b.In Progress             ::    215      219      128       59       44        0               0
 c.Completed               ::    138      385      475      544      560      604             604
##########################################################################################
4. Completed Case Results  ::
 a.Vacant (01)             ::      8       16       21       25       26       27              27
 b.Not An HU (02)          ::      3       11       13       14       15       15              15
 c.Temp./Vacation Home (03)::      0        0        0        1        1        1               1
 d.Refusal (04)            ::      0        2        2       13       13       41              41
 e.No One At Home (05)     ::      0        0        0        3        3       17              17
 f.No Eligible Resp. (06)  ::      0        0        0        0        0        0               0
 g.Language Barrier (07)   ::      0        0        0        0        1        1               1
 h.Other (08)              ::      0        0        0        0        0        0               0
 i.Completed Screener (09) ::    127      356      439      488      501      502             502
 Total (Must equal 3.c)    ::    138      385      475      544      560      604             604
##########################################################################################
```

Figure 9. Final status report for household screening in Antioch/Pittsburg, CA.

Field data collection activities in Contra Costa County began on Monday, June 4, 1984, immediately after completion of activities in Los Angeles County. One hundred and twenty-one cases were divided among the interviewers and were worked during the next three weeks. All interviewing and appointment creation was completed by June 23, with final appointments scheduled for the 24th. For the 82 respondents interviewed who had scheduled appointments, 71 complete sets of data were obtained. Eleven appointments became field refusals or broken appointments which were unable to be rescheduled.

Questionnaires and other data collection forms were returned to survey research staff by the analytical chemistry staff who executed the environmental and biological sampling.

Based on the documents returned from the field and the interim status code reports taken from the interviewer, a final interview status code was assigned to each case fielded. For each case coded as a completed interview, a final monitoring status code was assigned to indicate completed data collection and broken appointments or field refusals.

All batches of data, having been scan-edited during the batching process, were submitted for the final edit and code steps. All batches were processed using the edit instructions previously compiled and the code lists developed during earlier rounds of TEAM activities. New codes were appended to the previous list. The codes and edit specifications will be provided to the statistical analysts as needed.

The completed batches of Exposure/Activity Screeners were taken to data entry after all batches had been processed. A brief training session was held for the keying staff and processing begun. Eleven batches, containing 240 cases were keyed, and 100% key-verified without major problems. The Study Questionnaires were submitted next and were processed in the same manner. Nine batches contained 187 cases. The difference between the number of cases is due to the repeat visits in Los Angeles which generated Exposure/Activity Screeners but no questionnaires. One case in Contra Costa yielded an Exposure/Activity Screener by no Study Questionnaire.

After all data was entered, the tapes were prepared for analysis, and then hard copy data placed in storage.

SECTION 6

CHEMICAL SAMPLING AND ANALYSIS

GENERAL COMMENTS

Personal air, fixed-site air, drinking water and breath samples were collected during three sampling efforts in California as part of the Phase III Total Exposure Methodology Study (TEAM). This phase involved two sampling trips to the Los Angeles county area and a single trip to the Contra Costa county (San Francisco Bay) area. Table 31 list the samples collected from each participant. The target compounds selected for each sample type are shown in Table 32. Preliminary water samples were collected from five California water sources (Table 33) and analyzed to assist in the selection of water targets. The results of these analyses are discussed under "Water Volatiles". Fixed-site air samples were collected from each Primary Sampling Unit (PSU), generally on the property of a study participant. Field control and field blank samples, equal to 10% of the field samples of that sample type, were exposed in the field. Similarly, duplicate samples, equal to 10% of the total number of samples, were collected for each matrix. Prior to actual field work, a schedule for collecting, exposing, preparing, and shipping of field, blank and control, and duplicate samples was prepared. An example of this schedule is presented in Appendix I. This schedule was strictly adhered to during field chemical sampling.

Prior to any project activities relating to sample collection in Phase III, Standard Operating Procedures (SOPs) were drafted and subjected to a rigorous review process. These documents, derived from the extensive experience in sampling and analysis gained during previous phases of the TEAM study, are presented as a separate volume (Vol. IV) to this report. In summary, it was the intent of the SOPs to provide rigid and uniform guidelines for the collection and analysis of all samples collected. Thorough familiarity with all details of the procedures was required of each member of the analytical sampling staff

TABLE 31. SAMPLES COLLECTED FROM EACH PARTICIPANT

Sample Type	Number Collected/Participant
Personal Air	2
Water	2
Breath	1

TABLE 32. TARGET COMPOUNDS SELECTED FOR MONITORING IN ENVIRONMENTAL MEDIA

Matrix: Personal and Fixed-Site Air

Chloroform
1,1,1-Trichloroethane
Benzene
Carbon tetrachloride
Trichloroethylene
Tetrachloroethylene
n-Decane
Dodecane
1,4-Dioxane
1,1,1,2-Tetrachloroethane
α-Pinene

Chlorobenzene
Styrene
o,*m*,*p*-Dichlorobenzenes
Ethylbenzene
o,*m*,*p*-Xylenes
1,2-Dibromoethane
Undecane
n-Octane
1,2-Dichloroethane
1,1,2,2-Tetrachloroethane

Matrix: Drinking Water

Chloroform
Trichloroethylene
Dibromochloromethane
Chlorobenzene

1,1,1-Trichloroethane
Bromodichloromethane
Tetrachloroethylene
Bromoform

Matrix: Breath

Bromodichloromethane
Dibromochloromethane
Chloroform
1,1,1-Trichloroethane
Benzene
Carbon tetrachloride
Tetrachloroethylene
n-Decane
Dodecane
1,4-Dioxane
1,1,1,2-Tetrachloroethane
Bromoform

Chlorobenzene
Styrene
o,*m*,*p*-Dichlorobenzene
Ethylbenzene
o,*m*,*p*-Xylenes
Trichloroethylene
1,2-Dibromoethane
n-Octane
Undecane
1,2-Dichloroethane
1,1,2,2-Tetrachloroethane
α-Pinene

TABLE 33. PRETRIP WATER SAMPLES

Torrange Municipal Water Dependent

Source: Groundwater

California Water Service Co.

Source: Groundwater

Los Angeles City Water Works District

Source: M.W.D. (Metropolitan Water District) - surface

Dominquez Water Co.

Source: Groundwater

Antioch Water Treatment Plant

Source: Surface water

prior to departure to the field. Quality assurance audits of the sampling practices were made to assess adherence to the procedures. In rare and isolated cases, revisions to the procedures were required. These revisions were made only after formal documentation of the rationale for the change and technical and administrative approvals had been granted. The following brief descriptions of collection and analysis are distillations of the actual SOPs.

A schedule of events, and approximate times, is shown in Table 34. Actual sampling times were scheduled, in as much as was possible, to minimize burden on the participant. Under this regimen, an analytical sampling team (consisting of two chemists) was able to initiate sampling on three participants per day. During Phase III of the TEAM study, two sampling teams operating simultaneously were able to sample an average of 5 respondents per day. As in previous phases of this study, the sampling teams were supervised by a Site Administrator.

A center of operations was set up at each of the sampling sites. This generally consisted of a conference-type room with additional work tables. All sampling equipment, with the exception of the spirometers, were contained in this room. Furthermore, all sampling preparation activities and sampling media storage (e.g. Tenax cartridges) were conducted in this room.

Water, air and breath samples were inventoried and shipped from the field site by express air carrier to the analytical laboratory at regular intervals (generally weekly) where they were again inventoried, examined for contamination and breakage and stored at either -20°C (air and breath) or 4°C (water) awaiting analysis. Selected samples were shipped to independent (QA) laboratories for analysis. Personal air, fixed-site air, and breath QA samples were analyzed by PEDCo Environmental, Inc., Cincinnati, OH. Water QA samples were analyzed by the University of Miami, Division of Chemical Epidemiology.

Air Volatiles

Volatile organic compounds were collected by pulling air through a 6.0 × 1.3 cm i.d. bed of Tenax GC contained in a glass tube using a constant flow pump (DuPont Model P125A). Preparation of these cartridges followed an extremely rigorous procedure (described in detail in the SOP) to ensure minimal background from the sampling device. Pump flows were adjusted to provide for sampling approximately 20 liters of air over the anticipated sample collection

TABLE 34. SCHEDULE FOR COLLECTING STUDY SAMPLES

Day	Time	Function
1	7 - 9 PM	1) Set up personal and fixed-site air sampling equipment. 2) Explain sampling procedures to participant. 3) Collect presampling questionnaires.
2	6 - 9 AM	1) Collect personal and fixed-site air samples. 2) Expose second set of personal and fixed-site air samples. 3) Collect water sample.
	3 - 6 PM	1) Collect second set of personal and fixed-site air samples 2) Collect second water sample. 3) Administer exposure questionnaire. 4) Collect breath sample. 5) Present incentive.

period. Glass fiber filters (Gelman, 25 mm) were attached to the inlet end of the Tenax cartridge to remove particulates from the sampled air. For personal air sampling, the pump and cartridge were carried by the participant with the inlet of the sample cartridge located in the subject's breathing zone. A sampling vest was designed to provide for this location and to minimize participant inconvenience during sampling. For fixed-site air sampling, the pump and cartridge were placed inside a metal box for protection, with only the inlet end of the sample cartridge protruding. Tenax GC cartridges were stored in a helium-isolation environment at all times, except during actual sample collection.

Accuracy and precision of the method were evaluated by analyzing field and laboratory control samples. Controls were Tenax cartridges fortified with approximately 200 ng of each target compound prior to sampling. Some control cartridges were stored in the laboratory (lab controls), others were transported to the field sampling site and treated as field samples (field controls). Blank and control cartridges were exposed with field samples at a frequency equal to 10% of the field samples transporting unopened into the participants house along with the sample cartridges and then returning to sealed storage. Exposed Tenax GC cartridges were analyzed by thermal desorption - injection capillary gas chromatography/mass spectrometry. In brief, volatile organics were thermally desorbed from the Tenax GC at 260°C with a nominal helium flow and into a liquid nitrogen-cooled nickel-capillary trap (1-3). The condensed vapors were then introduced into a high resolution fused silica capillary chromatography column by balistic heating of the nickel trap to 250°C (2,4). Sample constituents were characterized and quantitated by electron impact mass spectrometry by measuring the intensity of the extracted ion current profile (2,5,6).

During Phases I and II of this study, the method of relative molar response (RMR) was used to quantitate compounds of interest found on sample cartridges. In Phase III, an alternate approach (detailed in the Phase III Work Plan) was used. This procedure involved the use of relative response factors (RRF). At the start of each day of analysis, an RRF cartridge was analyzed, which contained known amounts of all of the analytes (plus the quantitation standards, perfluorobenzene and perfluorotoluene) loaded via a permeation system. Where permeation tubes were not available the flash evaporation loading process was used.

The method of calculating RRFs was as follows:

$$(1)\quad RRF_{anal/std} = \frac{A_{anal}/g_{anal}}{A_{std}/g_{std}}$$

where: A = system response (integrated peak area)
g = number of grams of analyte present
anal = analyte
std = standard

The value of the RRF was determined from at least five independent analyses during analysis of samples (1). Sample mass (g_{anal}) of volatile organics per cartridge was then calculated from:

$$(2)\quad g_{anal} = \frac{A_{anal} \times g_{std}}{A_{std} \times RRF_{anal/std}}$$

Since the volume of air collected for a given sample was accurately known and the quantity of substance per cartridge was determined, the level in ambient air could be calculated from:

$$(3)\quad \mu g/m^3 = \frac{(\mu g_{anal} - \mu g_{bkg})1000\ L/m^3}{m^3 \times \text{volume sampled (L)} \times \text{rec}}$$

where: rec = the recovery factor obtained from analysis of field control samples.

Control and RRF cartridges were prepared using permeation and flash evaporation techniques to encompass all target compounds. Permeation tubes were regularly calibrated to insure accurate loading. Calibration results for Phase III are shown in Table 35. The percent relative standard deviations during the periods of use never exceeded 10% and were generally less than 5%, indicating a high degree of tube stability.

TABLE 35. PERMEATION TUBE STABILITY - PHASE 3 STUDIES

	Tube Code	Los Angeles - Season 1[a]			Los Angeles - Season 2[b]			Contra Costa[c]		
		Rate[d]	%RSD[e]	No. Calib.[f]	Rate	%RSD	No. Calib.	Rate	%RSD	No. Calib.
Chloroform	28	148	1.1	5	148	1.5	4	148	1.5	4
1,1,1-Trichloroethane	50	222	1.4	5	212	1.0	5	212	1.0	5
Benzene	19	392	1.8	5	395	1.3	4	395	1.3	4
Carbon tetrachloride	117	262	1.1	5	260	1.3	4	260	1.3	4
1,2-Dichloroethane	72	421	1.9	5	422	1.7	4	422	1.7	4
Trichloroethylene	52	508	2.1	5	510	1.3	4	510	1.3	4
Tetrachloroethylene	14X	418	1.1	5	416	1.0	4	416	1.0	4
Chlorobenzene	1X	173	3.2	5	174	0.7	4	174	0.7	4
m-Dichlorobenzene	16X				99	5.1	3	99	5.1	3
1,1,2,2-Tetrachloroethane	55	571	4.4	5	586	4.5	4	586	4.5	4
1,2-Dibromoethane	107	120	3.2	5	119	2.2	4	119	2.2	4
d_5-Bromoethane	34X	207	2.9	5	212	1.9	3	212	1.9	3
d_{10}-Ethylbenzene	171	199	1.5	5	199	0.6	3	199	0.6	3
d_5-Chlorobenzene	173	360	3.6	5	361	1.9	3	361	1.9	3
d_6-Benzene	35X	317	2.1	5	322	0.3	3	322	0.3	3
Perfluorobenzene	27X	4128	4.0	4						
	8	4846	6.9	4	5034	5.7	4	5047	5.0	5
Perfluorotoluene	28X	2655	9.7	5						
	13	2778	9.1	5	2996	5.7	5	2967	5.7	6
	14	2925	8.3	4	2929	6.7	4	2967	6.1	4

[a] Calibration period: 1/29/84 - 4/20/84.

[b] Calibration period: 5/17/84 - 6/27/84.

[c] Calibration period: 6/4/84 - 7/25/85.

[d] Permeation rate (ng/min).

[e] Percent relative standard deviation.

[f] Number of calibrations performed during the period specified.

Water Volatiles

Water samples were collected in the morning and in the evening from the kitchen tap (or alternate primary drinking water source) in each respondent's home. The tap was turned on and allowed to run for 20 seconds prior to sampling. Samples were collected without headspace in 64 mL amber glass bottles with sodium thiosulfate added to quench residual chlorine, if present. The bottles were quickly sealed, cooled in ice and refrigerated until analysis.

Details of the analytical procedure are presented in the project Work Plan. In brief, a 5 mL water sample was introduced into the purging apparatus and the volatile organic compounds partitioned from the aqueous phase with helium and swept onto a Tenax GC trap. The trapped compounds were thermally desorbed from the trap, transported to the chromatography column (1.8 m × 2 mm i.d. glass column packed with 1% SP-1000 on Carbopack B) with carrier gas and separated under temperature programmed conditions. These conditions successfully separated all analytes. The column effluent was split between a Hall electrolytic conductivity detector (HECD) and a flame ionization detector (FID). This extraction/concentration procedure enhances the sensitivity over direct injection by a factor of approximately 1000. All calibration data was processed using a polynomial regression approach due to slight non-linearity of the calibration.

The analysis of control samples was conducted to obtain recovery factors for each analyte. Each target compound was fortified into pre-purged, distilled-deionized water (25 mL). A portion of the control samples were stored at 4°C at RTI during the field sampling activities (lab controls), and a portion was transported to the field sampling site and exposed according to the Sample Collection Schedule. Limits of detection for water samples are presented in Table 36.

Breath Volatiles

Breath samples were collected from each participant using the procedure and apparatus presented in the SOP for this function. Tedlar bags used in this operation, both inhale and exhale, were "rinsed" once and then stored (full) with helium until needed for sample collection. Similarly, Teflon spirometer mouthpieces were stored in methanol when not in use. Immediately prior to collection of a breath sample, the helium was expelled from the bag and the

TABLE 36. LIMITS OF DETECTION FOR VOLATILE ORGANICS IN WATER[a]

	Sampling Site - Season		
	LA-1	LA-2	CC
Chloroform	1.5	1.5	1.5
1,1,1-Trichloroethane	0.1	0.05	0.05
Carbon tetrachloride			
Trichloroethylene	0.1	0.05	0.05
Bromodichloromethane	0.3	0.05	0.05
Dibromochloromethane	0.2	0.3	0.3
Tetrachloroethylene	0.05	0.05	0.05
Chlorobenzene	0.2	0.05	0.05
Bromoform	0.6	0.3	0.3

[a] Expressed in μg/L.

mouthpiece was removed from the alcohol. In this collection procedure, the subject exclusively inhales humidified ultrapure air and subsequently exhales through a valved mouthpiece of a spirometer into a 40 L Tedlar bag. The breath sample is then pumped through two parallel Tenax cartridges to adsorb and concentrate the organic cmpounds for later analysis. The distribution of flows through these two cartridges was established so as to provide a 20 L sample on one of the cartridges. These cartridges were analyzed identically to those containing air samples.

Computer Software for Data Reduction--

The computer programs described in Volume II of this report were employed for data reduction. Slight software modifications were required to change the target compounds.

PRELIMINARY STUDIES

California Prescreening Study

Fixed-Site Ambient Air Monitoring--

A survey was made of the Los Angeles and Contra Costa county areas to collect ambient air samples. These samples were analyzed for site-specific pollutants. The prescreening study was designed to sample ambient air at fixed-sites in two areas in Los Angeles county (Torrance; Carson/Dominquez) and two areas in Contra Costa county (Richmond; Antitoch/Pittsburg/Clyde). Several sites within each of these areas were identified as potential point source. Three daytime sampling periods were employed to minimize the effect of sudden changes in wind direction. Samples were collected simultaneously at each of the downwind monitors for a period of three hours (total volume collected = 18-21 L @ 105-115 mL/min).

Table 37 summarizes the locations of the fixed-site daytime ambient air samples. A total of 97 individual ambient air samples were collected for analysis. All of these samples were analyzed by GC/MS/COMP according to the appropriate SOP. From this group of 97 samples, 22 were selected for comprehensive, qualitative interpretation. These samples were selected based on empirical observations made during sampling. Meteorological conditions and olfactory observations were considered in making these selections.

The results of the comprehensive interpretations, shown in Table 38, were used to assist in selecting target compounds for the Phase III study.

TABLE 37. SUMMARY OF SITES AND LOCATIONS OF FIXED-SITE DAYTIME AMBIENT AIR SAMPLES

Area	Site	Location	Period (Date/Time)	Samples Selected
A1: Torrance, CA	S1: PPG and Dow Chemical	L1	P1 (9/1/83/0904-1222)	
			P2 (9/1/83/1224-1530)	
			P3 (9/1/83/1531-1829)	
		L2	P1	X
			P2	
			P3	X
		L3	P1	
			P2	
			P3	
		L4	P1	
			P2	
			P3	
	S2: Jones Chemical	L1	P1 (9/1/83/1019-1327)	
			P2 (9/1/83/1329-1630)	
			P3 (9/1/83/1631-1938)	
		L2	P1	X
			P2	
			P3	X
		L3	P1	
			P2	
			P3	
A2: Carson/ Dominguez, CA	S1: Stauffer Chemicals (Sulfuric Acid Div.)	L1	P1 (9/2/83/0943-1234)	X
			P2 (9/2/83/1238-1557)	
			P3 (9/2/83/1600-1907)	X
		L2	P1	
			P2	
			P3	
	S2: Nalco Chemical Co.	L1	P1 (9/2/83/1003-1315)	
			P2 (9/2/83/1317-1616)	
			P3 (9/2/83/1618-1915)	

(continued)

TABLE 37 (cont'd.)

Area	Site	Location	Period (Date/Time)	Samples Selected
		L2	P1	
			P2	
			P3	
		L3	P1	X
			P2	
			P3	X
	S3: Stauffer Chemicals (Plastics Division)	L1	P1 (9/2/83/1054-1336)	
			P2 (9/2/83/1337-1640)	
			P3 (9/2/83/1641-1935)	
		L2	P1	X
			P2	
			P3	X
A3: Richmond, CA	S1: Ortho "Difolitan Plant"	L1	P1 (9/7/83/0915-1219)	X
			P2 (9/7/83/1220-1524)	
			P3 (9/7/83/1525-1821)	X
		L2	P1	
			P2	
			P3	
	S2: Chevron Chemicals	L1	P1 (9/7/83/0946-1243)	X
			P2 (9/7/83/1245-1547)	
			P3 (9/7/83/1548-1837)	X
		L2	P1	
			P2	
			P3	
	S3: General	L1	P1 (9/7/83/1005-1305)	
			P2 (9/7/83/1306-1603)	
			P3 (9/7/83/1605-1900)	
		L2	P1	
			P2	
			P3	

(continued)

TABLE 37 (cont'd.)

Area	Site	Location	Period (Date/Time)	Samples Selected
		L2	P1	
			P2	
			P3	
		L3	P1	X
			P2	
			P3	X
	S3: Stauffer Chemicals (Plastics Division)	L1	P1 (9/2/83/1054-1336)	
			P2 (9/2/83/1337-1640)	
			P3 (9/2/83/1641-1935)	
		L2	P1	X
			P2	
			P3	X
A3: Richmond, CA	S1: Ortho "Difolitan Plant"	L1	P1 (9/7/83/0915-1219)	X
			P2 (9/7/83/1220-1524)	
			P3 (9/7/83/1525-1821)	X
		L2	P1	
			P2	
			P3	
	S2: Chevron Chemicals	L1	P1 (9/7/83/0946-1243)	X
			P2 (9/7/83/1245-1547)	
			P3 (9/7/83/1548-1837)	X
		L2	P1	
			P2	
			P3	
	S3: General	L1	P1 (9/7/83/1005-1305)	
			P2 (9/7/83/1306-1603)	
			P3 (9/7/83/1605-1900)	
		L2	P1	
			P2	
			P3	

(continued)

TABLE 37 (cont'd.)

Area	Site	Location	Period (Date/Time)	Samples Selected
	S4: Stauffer "Devrinol Plant"	L1	P1 (9/7/83/1116-1433)	
			P2 (9/7/83/1434-1729)	
		L2	P1	X
			P2	X
A4: Antioch/ Pittsburgh/Clyde, CA	S1: Stauffer (Chloro-alkali) & Dow Chem.	L1	P1 (9/10/83/0915-1222)	
			P2 (9/10/83/1224-1516)	
			P3 (9/10/83/1517-1825)	
		L2	P1	
			P2	
			P3	
		L3	P1	
			P2	
			P3	
		L4	P1	X
			P2	
			P3	X
	S2: Allied and Chemical & Pigment Co.	L1	P1 (9/10/83/1016-1301)	X
			P2 (9/10/83/1304-1553)	
			P3 (9/10/83/1554-1902)	X
		L2	P1	
			P2	
			P3	
		L3	P1	
			P2	
			P3	
	S3: TOSCO Ref. and Monsanto Chemical	L1	P1 (9/10/83/1043-1329)	
			P2 (9/10/83/1331-1623)	
			P3 (9/10/83/1625-1925)	
		L2	P1	X
			P2	
			P3	X

TABLE 38. SELECTED COMPOUNDS IDENTIFIED IN PRESCREENING AMBIENT AIR MONITORING[a]

Compound	A1,S1,L2[b]	A1,S2,L2	A2,S1,L1	A2,S2,L3	A2,S3,L2	A3,S1,L1	A3,S2,L1	A3,S4,L2
Chloroform	X	X			X		X	
1,2-Dichloroethane								
1,1,1-Trichloroethane	X X	X	X X	X	X X		X	
Benzene	X X	X X	X X	X X	X X	X X	X X	X X
Carbon tetrachloride		X	X		X		X	
Bromodichloromethane								
Trichloroethylene	X	X X	X X	X X		X X	X X	X
p-Dioxane								
Chlorodibromomethane								
1,2-Dibromoethane								
n-Octane	X X	X X	X	X	X X		X	
Tetrachloroethylene	X X	X X		X X	X	X X	X X	X X
Chlorobenzene								
1,1,1,2-Tetrachloroethane			X					
Ethylbenzene	X X	X X	X	X	X X	X X	X X	X X
Bromoform								
p-Xylene	X X	X X	X	X X	X X	X	X	X X
Styrene	X X	X X	X	X X	X	X	X	X
o-Xylene	X X	X	X	X X	X X	X	X X	X X
1,1,2,2-Tetrachloroethane								
α-Pinene								
m-Dichlorobenzene	X	X	X	X	X		X	X
p-Dichlorobenzene								
n-Decane	X X	X X	X X	X X	X X	X X	X X	X X
o-Dichlorobenzene	X	X		X	X			
n-Undecane	X X	X X	X X	X X	X X	X X	X X	X
n-Dodecane	X X	X	X X	X X	X X	X X	X X	

(continued)

TABLE 38 (cont'd.)

Compound	A3,S4,L2	A5,S1,L4[c]	A4,S1,L4[c]	A4,S2,L1	A4,S3,L2	Frequency
Chloroform				X	X X	7
1,2-Dichloroethane						0
1,1,1-Trichloroethane		X				10
Benzene	X X	X	X	X X	X X	22
Carbon tetrachloride		X	X		X	7
Bromodichloromethane						0
Trichloroethylene	X	X		X	X	15
p-Dioxane						0
Chlorodibromomethane						0
1,2-Dibromoethane						0
n-Octane			X	X	X	12
Tetrachloroethylene	X X	X	X	X X	X X	19
Chlorobenzene		X				1
1,1,1,2-Tetrachloroethane						1
Ethylbenzene	X X	X	X	X X	X	19
Bromoform						0
p-Xylene	X X	X		X X	X	17
Styrene	X	X			X X	14
o-Xylene	X X	X		X X	X	17
1,1,2,2-Tetrachloroethane						0
a-Pinene						0
m-Dichlorobenzene	X	X		X	X	10
p-Dichlorobenzene						3
n-Decane	X X	X	X	X	X	20
o-Dichlorobenzene					X	5
n-Undecane	X	X	X	X X	X X	21
n-Dodecane			X			14

[a] Duplicate samples.

[b] Area 1, Site 1, Location 2 (see Table 37).

[c] Single sample.

Drinking Water Source Sampling--

Precleaned glass bottles (64 mL) were shipped to each of the locations identified in Table 33. Samples were collected by on-site municipal employees, cooled to approximately 4°C, and returned to RTI by express air carrier. Upon return, the samples were analyzed by purge and trap GC/MS/COMP.

Compounds identified are shown in Table 39. The prominence of brominated chemicals (even at levels exceeding chloroform) was evident. These compounds were added to the target list for quantitation during Phase III.

Comparison of Control Cartridge Preparation Procedures

In all previous sampling efforts, two cartridges were loaded for control samples, since two independent mechanisms were required for incorporating all of the target cmpounds. These two procedures utilized a permeation system and a flash evaporation system. In the former case, the compounds permeate from a tube containing the neat material into a gas stream which subsequently passes through a Tenax GC cartridge. In the second approach, small quantities of dilute solutions of the compounds in methanol are injected into a heated chamber where they are swept onto the cartridge with a small volume of gas. Historically, the two mechanisms had been required because not every target compound could be incorporated into a permeation tube. Since a single control cartridge would reduce cartridge preparation time/cost, as well as analysis effort, a study was conducted to assess the feasibility of preparing a single control cartridge.

Seven compounds, covering a wide range of breakthrough volumes, were selected from the target list and were loaded onto cartridges. Three cartridges were loaded with compounds from the permeation system, three were loaded with compounds from the flash evaporation system, and three were loaded with compounds from both permeation and flash evaporation systems. To minimize potential problems with compound breakthrough, compounds were loaded from the flash evaporation system prior to those loaded from the permeation system. This also allows for removal of the solvent since methanol has an extremely low breakthrough volume on Tenax. Approximately 600 mL of helium were used for flash system loading, followed by 300 mL for permeation system loading. All cartridges were analyzed by capillary GC/FID with electronically integrated detector response.

TABLE 39. CHEMICALS IDENTIFIED IN DRINKING WATER FROM TORRANCE AND VICINITY, CA AND ANTIOCH/PITTSBURG, CA

Chemicals Identified	Location/Source									
	LACWWD-1[a]	LACWWD-2	TMWD-1[b]	TMWD-2	AWTP-1[c]	AWTP-2	CWSD-1[d]	CWSD-2	DWC-1	DWC-2
Chloroform	X	X		X	X	X			X	X
Bromodichloromethane	X	X	X	X	X	X				
Dibromochloromethane	X	X	X	X	X					
Bromoform			X	X						

[a] LACWWD = Los Angeles City Water Works District.

[b] TMWD = Torrance Municipal Water Department.

[c] AWTP = Antioch Water Treatment Plant.

[d] CWSD = California Water Service Co.

[e] DWC = Dominquez Water Co.

The results, shown in Table 40, illustrate no observable differences between amounts determined on separate permeation and flash system cartridges, and on the cartridges loaded with both systems. Even compounds with relatively low breakthrough volumes (e.g. vinylidene chloride; 1,1,1-trichloroethane) were unaffected by single cartridge labeling. Based on these results, single control cartridges were used on subsequent sampling trips in California.

Method Detection Limit Study

A study was performed to determine method detection limits for the target compounds by GC/MS/COMP using the "Calculation of Data Quality Indicators" approach. Method detection limits are defined as the minimum concentration of a substance that can be measured and reported with 99% confidence that the true value, corresponding to a single measurement, is not zero. This study was conducted in two phases, where the first phase revealed the analyte concentrations which should be used to actually determine the method detection limits in the second phase.

In Phase 1, a group of 18 cartridges was loaded with the target compounds at 3, 5, 10, and 20 times the historical LOD. These cartridges were transported by commercial passenger airline to Washington DC and returned. The results of the analysis of these cartridges by GC/MS/COMP revealed that the most appropriate concentration (on the basis of data precision) to perform the actual MDL study (Phase 2) was five times the instrumental LOD. In Phase 2, a group of 14 cartridges was loaded with target compounds at approximately fives times the historical limit of detection for the Finnigan 3300 GC/MS system. These cartridges were shipped to the field sampling site and were treated, in all aspects of the sampling and analysis schemes, as field controls.

Seven cartridges were analyzed on each of the GC/MS/COMP systems. Percent recoveries and percent relative standard deviations were computed for each target on each instrument. Method detection limits were calculated from the equation:

$$(4) \quad \mathrm{MDL} = S(t_{(.99)})$$

where: S = standard deviation
$t_{(.99)}$ = student's t value at the 99% confidence level for 6 degrees of freedom

TABLE 40. SINGLE CONTROL CARTRIDGE LOADING RESULTS (RAW AREAS COUNTS) - PERMEATION SYSTEM PLUS FLASH EVAPORATION SYSTEM

	Permeation System Alone				Permeation System + Flash Evaporation System			
Compound	Run #1	Run #2	Run #3	Mean ± S.D. (CV)	Run #1	Run #2	Run #3	Mean ± S.C. (CV)
1,1,1-Trichloroethane	1,945	2,024	2,144	2,038 ± 100 (4.9)	2,374	2,172	2,228	2,258 ± 104 (4.6)
Benzene	12,837	12,782	9,481	11,700 ± 1922 (16)	9,532	9,535	10,546	9,871 ± 584 (5.0)
Tetrachloroethylene	3,980	4,394	4,363	4,246 ± 231 (5.4)	4,499	4,368	4,238	4,368 ± 130 (3.0)

	Flash System Alone				Flash System + Permeation System			
Compound	Run #1	Run #2	Run #3	Mean ± S.D. (CV)	Run #1	Run #2	Run #3	Mean ± S.D. (CV)
Dichlorobromomethane	726	804	738	756 ± 42 (5.5)	4,805	4,663	4,495	4,654 ± 155 (3.3)
Styrene	10,057	10,250	9,989	10,098 ± 135 (1.3)	9,787	9,714	9,734	9,745 ± 37 (.4)
o-Xylene	9,963	11,526	11,345	10,944 ± 855 (7.8)	10,015	9,320	9,610	9,648 ± 349 (3.6)
Vinylidene chloride	10,233	7,369	6,946	8,183 ± 1788 (21.9)	8,771	8,656	8,884	8,770 ± 114 (1.3)

Table 41 illustrates the MDLs for the two systems. Recoveries in excess of 100% reflect the fact that subtraction of endogenous cartridge background interferences was not performed. In general, the calculated MDL exceeded the historical LOD by approximately a factor of three. From tabulated t-values, this approach suggests that reported concentrations at this LOD would have an 80% confidence that the true value were above zero. This apparent disparity, however, does not necessarily ascribe greater credibility to one value over the other since precision associated with replicate determinations is known to be dependent upon concentration. In essence, these data show that there are two different techniques for assessing a reliable concentration threshold, each having arguable merit. The decision to use the LOD approach during Phase 3 was based essentially on a desire to preserve continuity with Phases I and II.

LOS ANGELES COUNTY

First Season

Introduction--

During the period February 3 through March 2, 1984, 117 people from Los Angeles County, CA participated in the Total Exposure Assessment Methodology Study. These individuals were residents of Torrance, Carson, Hermosa Beach, Redondo Beach, Manhattan Beach, Lawndale, El Nido, Lmita, Harbor City, Walteria, Hollywood Riviera and Victoria Park, CA. Table 42 summarizes the environmental and biological sample collection results. Missing samples were accounted for in all cases and were generally due to accidental sample container breakage, pump malfunction or improper collection by study participants. At the conclusion of sampling, the majority of the sampling equipment was stored in a commercial storage facility for use during the second season.

Air Volatiles--

All aspects of the sample collection procedure proceeded smoothly. No difficulties were encountered with sampling pump flow irregularities, as had been experienced in previous studies. Loss of samples due to actual pump failure was negligible.

Instrumental limits of detection were calculated for each of the mass spectrometers used during the analysis. Representative values for the target compounds are listed in Table 43.

TABLE 41. METHOD DETECTION LIMITS CALCULATED FROM THE STANDARD DEVIATION AND 99% CONFIDENCE INTERVAL[a]

Compound	Historical LOD[b]	Amount Loaded (ng; 5 × LOD)	Finnigan 3300[c]			Finnigan 4021[c]		
			%Recovery	%RSD	MDL	%Recovery	%RSD	MDL
Chloroform	6	30	131	6	7	110	11	12
1,2-Dichloroethane	7	28	120	12	12	117	14	15
1,1,1-Trichloroethane	7	44	143	13	26	110	19	29
Benzene	3	26	223	11	19	172	21	30
Carbon tetrachloride	10	52	109	10	18	87	15	22
Bromodichloromethane	10	55	-[d]			-[d]		
Trichloroethylene	14	34	119	29	37	131	29	41
p-Dioxane	5	26	95	29	35	115	25	24
Chlorodibromomethane	10	51	-[d]			-[d]		
1,2-Dibromoethane	5	25	84	26	17	81	30	19
n-Octane	5	26	67	39	22	91	36	27
Tetrachloroethylene	10	28	78	29	20	124	29	31
Chlorobenzene	4	34	67	31	22	96	28	29
Ethylbenzene	3	15	103	31	15	97	26	12
Bromoform	10	58	-[d]			-[d]		
m,*p*-Xylene	3[e]	-	-			-		
Styrene	4	24	88	34	22	123	23	22
o-Xylene	3	15	111	26	14	119	17	10
1,1,2,2-Tetrachloroethane	5	40	46	39	22	108	58	78

(continued)

TABLE 41 (cont'd.)

Compound	Historical LOD[b]	Amount Loaded (ng; 5 × LOD)	Finnigan 3300[c]			Finnigan 4021[c]		
			%Recovery	%RSD	MDL	%Recovery	%RSD	MDL
α-Pinene	4	22	64	32	14	86	13	8
m,*p*-Dichlorobenzene	4	23	61	48	21	106	13	10
n-Decane	5	26	72	37	22	103	12	10
o-Dichlorobenzene	4[f]	-	-	-	-	-	-	-
n-Undecane	5	26	79	37	24	110	16	14
n-Dodecane	5	26	63	39	20	102	9	7

[a] MDL = $(t_{.99})(S)$; all values in ng unless otherwise indicated.

[b] Historical GC/MS data.

[c] Seven cartridges analyzed per GC/MS system.

[d] Not calculated.

[e] LOD based on *o*-xylene.

[f] LOD based on *m*,*p*-dichlorobenzene.

TABLE 42. SAMPLE COLLECTION RESULTS FOR LOS ANGELES COUNTY - SEASON 1

	Personal Air	Fixed Air	Breath	Drinking Water
Field Samples (scheduled[a]/collected)	236/234	50/50	125/116	250/231
Field Duplicates (scheduled/collected)	26/24	6/6	13/12	26/24
QA Duplicates (scheduled/collected)[b]	24/24	6/6	12/12	24/24
Field Blanks (scheduled/utilized)	18/18	4/4	-	12/14
Spirometer Blanks (scheduled/utilized)	-	-	9/9	-
QA Blanks (scheduled/utilized)[b]	4/4	1/1	4/4	4/4
Field Controls (scheduled/utilized)	18/18	4/4	9/9	12/14
QA Controls (scheduled/utilized)[b]	4/4	1/1	4/4	4/4

[a] Based on 118 respondents actually sampled.

[b] Analyzed by the quality assurance laboratory.

TABLE 43. REPRESENTATIVE INSTRUMENTAL LIMITS OF DETECTION FOR MASS SPECTRAL ANALYSIS[a]

	Sampling Site-Season		
	LA-1	LA-2	CC
Chloroform	1	1	1
1,2-Dichloroethane	1	1	1
1,1,1-Trichloroethane	1	1	1
Benzene	1	1	1
Carbon tetrachloride	1	1	1
Bromodichloromethane	1	1	1
Trichloroethylene	1	1	1
p-Dioxane	1	1	1
Chlorodibromomethane	1	1	1
1,2-Dibromoethane	1	1	1
n-Octane	1	3	1
Tetrachloroethylene	1	1	1
Chlorobenzene	1	1	1
1,1,1,2-Tetrachloroethane	1	1	1
Ethylbenzene	1	1	1
Bromoform	1	1	1
p-Xylene	1	1	1
Styrene	1	1	1
o-Xylene	1	1	1
1,1,2,2-Tetrachloroethane	1	1	1
α-Pinene	1	2	2
m-Dichlorobenzene		1	1
p-Dichlorobenzene	1	1	1
n-Decane	1	4	4
o-Dichlorobenzene	1	1	1
n-Undecane	1	4	1
n-Dodecane	1	5	5

[a] Calculated for the Finnigan 3300 (ng/cartridge).

Water Volatiles--

Water sample collection was simple, rapid and free of notable problems.

Breath Volatiles--

No problems accured during collection of breath samples.

Second Season

Introduction--

The second season Los Angeles county study was conducted on 52 participants during the period May 21 through June 2, 1984. The sample collection results are summarized in Table 44. Participants in this second season study had all participated in the first season study and consequently were familiar with the sample collection procedure.

Air Volatiles--

No major problems were encountered in the collection of personal and fixed-site air samples. Performance of sampling equipment was satisfactory.

The results of calculation of instrumental imits of detection for each of the mass spectrometers employed for analysis of Tenax cartridges are shown in Table 43.

Water Volatiles--

Water samples were collected without notable difficulty. Sample analysis was performed using the procedure outlined in the SOP.

Breath Volatiles--

No difficulties were encountered in the collection of breath samples.

CONTRA COSTA COUNTY

Introduction

Residents of Contra Costa county, CA participated in the TEAM study during the period June 8 through June 25, 1984. These 71 respondents were residents of Antioch and Pittsburgh, CA. Environmental and biological sample collection results are summarized in Table 45. Sample collection procedures were as described in the SOPs.

Air Volatiles--

Sample collection proceeded smoothly. As in previous studies, instrumental LODs were calculated for each of the gas chromatograph/mass spectrometers used for sample analysis. Representative values are shown in Table 43.

TABLE 44. SAMPLE COLLECTION RESULTS FOR LOS ANGELES COUNTY - SEASON 2

	Personal Air	Fixed Air	Breath	Drinking Water
Field Samples (scheduled[a]/collected)	104/104	48/48	52/51	104/104
Field Duplicates (scheduled/collected)	10/10	6/6	5/5	10/10
QA Duplicates (scheduled/collected)[b]	10/10	6/4	5/5	10/10
Field Blanks (scheduled/utilized)	8/8	4/4	-	6/6
Spirometer Blanks (scheduled/utilized)	-	-	4/4	-
QA Blanks (scheduled/utilized)[b]	1/1	1/1	0/0	1/1
Field Controls (scheduled/utilized)	8/8	4/4	4/4	6/6
QA Controls (scheduled/utilized)[b]	1/1	1/1	0/0	1/1
Lab Blanks (scheduled/utilized)	4/4	3/3	3/3	6/6
Lab Controls (scheduled/utilized)	4/4	3/3	3/3	6/6
Total	150/150	76/74	76/75	150/150

[a] Based on 52 respondents actually sampled.

[b] Analyzed by the quality assurance laboratory.

TABLE 45. SAMPLE COLLECTION RESULTS FOR CONTRA COSTA COUNTY

	Personal Air	Fixed Air	Breath	Drinking Water
Field Samples (scheduled[a]/collected)	142/141	10/10	71/71	142/142
Field Duplicates (scheduled/collected)	14/14	2/2	7/7	14/14
QA Duplicates (scheduled/collected)[b]	16/16	4/4	7/7	14/14
Field Blanks (scheduled/utilized)	11/11	3/3	-	7/7
Spirometer Blanks (scheduled/utilized)	-	-	5/5	-
QA Blanks (scheduled/utilized)[b]	1/1	1/1	1/1	1/1
Field Controls (scheduled/utilized)	11/11	3/3	5/5	7/7
QA Controls (scheduled/utilized)[b]	1/1	1/1	1/1	1/1
Lab Blanks (scheduled/utilized)	6/6	3/3	3/3	7/7
Lab Controls (scheduled/utilized)	6/6	3/3	3/3	7/7
Total				

[a] Based on 71 respondents actually sampled.

[b] Analyzed by the quality assurance laboratory.

Water Volatiles--

Water samples were collected without notable difficulty.

Breath Volatiles--

No problems were encountered with collection of breath samples.

PROBLEMS/IMPROVEMENTS

Strict adherence to Standard Operating Procedures confined difficulties with sampling and analysis to a minimum.

SECTION 7

QUALITY ASSURANCE

STANDARD OPERATING PROCEDURES (SOPs)

A total of forty-seven SOPs were prepared for use during Phase III of the TEAM study. These documents covered every project activity and are listed in Table 46. The initial draft was prepared by the staff member(s) who had the most "hands-on" experience with the particular operation. The draft received extensive peer review, was revised when required, and finally administrative approval.

Several different SOP formats were evaluated, and the one containing the best features of several different styles was finally selected. All of the TEAM SOPs are given in Volume IV.

LOS ANGELES, CALIFORNIA

First Trip

Field Operations--

The first collection of TEAM samples in the greater Los Angeles area was performed between February 6 and March 1, 1984. Sampling supplies and equipment were sent to the site by air freight and stored in a workroom at the Holiday Inn in Torrance, California. A system audit was performed at the sampling site by the RTI QA Officer between February 8 and February 14, 1984.

The description of the field activities presented below is based on the results of this audit and personal interviews with members of the analytical sampling staff. A complete audit report is presented in Appendix J.

Environmental and biological sample collection was accomplished by six two-person teams. Two teams were at the site during each of the three sampling periods (see Table 47). Each team was made up of one individual experienced in TEAM sampling techniques. One of the two experienced samplers was designated as the Site Administrator (SA) for that sampling period. The SA was responsible for the successful execution of the day-to-day sampling efforts and the overall

TABLE 46. APPROVED SOPs FOR PHASE III TEAM STUDY

RTI/ACS-SOP No.	SOP Title
320-001	Tenax Cleanup and Preparation
322-001	Cleanup of Water Collection Bottles
331-001	Collection of Personal Air Samples
331-002	Collection of Fixed Site Air Samples
332-001	Collection of Water Samples
337-001	Collection of Breath Samples
340-001	Shipment of Field Sampling Equipment
350-001	Site Workroom Procedures and Rules
350-002	Maintenance and Use of the Van
361-001	Calibration of DuPont P-125A Constant Flow Samples
367-002	Calibration of Nutech Model 221 Gas Sampler with a Dry Gas Meter
410-001	Using Sampling Protocol/Chain-of-Custody Sheet in the Field
431-001 (Air) 432-001 (Water) 437-001 (Breath)	Storage of Samples at the Field Sampling Site
461-001 (Air) 432-001 (Water) 467-001 (Breath)	Shipment of Samples from the Field to RTI
470-001	Receipt of Air, Breath, and Water Samples at RTI
482-001	Storage of Water Samples at RTI
481-001 (Air) 487-001 (Breath)	Storage of Tenax Samples at RTI
512-001	Analysis of Drinking Water by Purge Trap Gas Chromatography
533-001	Analysis of Organic Compounds Collected on Tenax Using the Finnigan 3300 GC/MS/COMP System
533-002	Analysis of Organic Compounds Collected on Tenax Using the Finnigan 4021 GC/MS/COMP System
612-001	Preparation of Purge and Trap Calibration Solutions

(continued)

TABLE 46 (cont'd.)

RTI/ACS-SOP No.	SOP Title
630-001	Preparing Relative Molar Response Tenax Cartridges Using a Permeation System
630-002	Preparing Relative Molar Response and Column Performance Evaluation Tenax Cartridges Using a Flash Evaporation System
630-003	Loading External Standards on Tenax Cartridges Via Injection Using a Permeation System
630-004	Loading Deuterium Standards on Tenax Cartridges Using a Permeation System
712-001	Quantitation of Volatile Organic Compounds in Water
711-001 (Air) 717-001 (Breath)	Quantitation of Volatile Organic Compounds in Tenax Samples
790-001	Preparation and Submission of Data Summary Sheets to the Center for Computer Application/Data Entry (CCA/DE)
810-001	Preparation and Handling of QA Performance Audit Samples on Tenax for GC/MS Analysis
812-001	Conducting a QA System Audit of Sample and Data Collection in the Field
860-001	Preparing Quality Control Samples on Tenax Cartridges
862-001	Preparation of Water Blanks and Controls
861-002 (Air) 862-002 (Water) 867-002 (Breath)	Shipment of QC Samples to the Field Sampling Site
861-003 (Air) 862-003 (Water) 867-003 (Breath)	Exposure of QC Samples
881-001 (Air) 882-001 (Water) 887-001 (Breath)	Submission of QA Samples to and Receipt of Data from a QA Laboratory

TABLE 47. LOS ANGELES 1 - ANALYTICAL SAMPLING STAFF ASSIGNMENTS AND EXPERIENCE

Team No.	Member	Dates Scheduled for Sampling	Sampling Experience[a]
1A	Site Adm.	2/6 - 2/12	NJ-1,2; GB; ND
	Inexp.	2/6 - 2/12	None
1B	Exp.	2/6 - 2/12	NJ-2
	Inexp.	2/6 - 2/12	None
2A	Site Adm.	2/12 - 2/24	NJ-1,2,3; GB; ND
	Inexp.	2/12 - 2/24	None
2B	Exp.	2/12 - 2/24	NJ-1,2,3; GB; ND
	Inexp.	2/12 - 2/24	NJ-1,2
3A	Site Adm.	2/24 - 3/1	NJ-1,2,3; GB; ND
	Inexp.	2/24 - 3/1	NJ-2
3B	Exp.	2/24 - 3/1	NJ-1,2; GB
	Inexp.	2/24 - 3/1	NJ-1,2

[a] NJ: Northern New Jersey - Trip No.
GB: Greensboro, NC
ND: Devils Lake, ND.

adherence to the study protocol. The experience and sampling assignment for each team is shown in Table 47.

The participant identification numbers reserved for this Los Angeles study were 41251 through 41375. Each number was followed by a computer-generated check digit. The first two numbers indicate that the sampling was conducted during the first trip of the fourth year of the study. The last three digits were unique and descriptive for this sampling trip and were utilized as the participant identification number.

A sample collection schedule (Table 48) was prepared at the start of the study. The schedule identified the participants from whom D-type and Q-type duplicates were to be collected. It also indicated the time to expose matrix field controls and blanks (QC sets). Both sample collections of a D-type duplicate set were analyzed at RTI. One of the samples of a Q-type duplicate set were analyzed at an independent laboratory. The frequency of duplicate collections and QC set exposure were based on guidelines issued by the Project Director and incorporated into the schedule such that the additional burden on the participant and sample collector was minimal.

The study participants were selected from twenty-five primary sampling units. One set (2 approximately 12 hour samples) of fixed site air collections were scheduled at the household of the first sampled participant residing in each unit. Duplicate collections were scheduled at three locations; quality assurance samples (Q-duplicates) were obtained at three additional residences.

Projections for the Los Angeles study included the recruitment and sampling of one hundred and twenty-five participants. However, only one hundred and seventeen individuals, or 93.6% of the projected number, were enlisted as respondents and utilized for sampling purposes. The corresponding completion figures for sample collection and analysis are shown in Table 49. A sample receipt report is shown in Table 50.

The methodology employed during the field operations was described in a series of standard operating procedures (SOPs) (Table 46). It was ascertained from the on-site audit and staff interviews that the approved SOPs were properly implemented at the collection site.

TABLE 48. LOS ANGELES 1 - SAMPLE COLLECTION SCHEDULE PARTIAL LISTING

	AV (Batch No.)				BR (Batch No.)				WV			
Participant No.	F	D	Q	QC	F	D	Q	QC	F	D	Q	QC
41251	2		2		1				2			
41252	2				1				2			
41253	2	2D		1	1				2		2	
41254	2				1				2			
41255	2				1				2	2		1
41256	2				1	1D		1	2			
41257	2				1				2			
41258	2				1				2			
41259	2				1		1		2			
41260	2			1	1				2			
41261	2		2		1				2			
41262	2				1				2			
41263	2	2D			1				2		2	
41264	2				1				2			
41265	2				1				2	2		1
-----		----					----				----	
-----		----					----				----	
-----		----					----				----	
-----		----					----				----	
41361	2		2		1				2			
41362	2				1				2			
41363	2	2D		1	1	1D		1	2		2	
41364	2				1				2			
41365	2				1				2	2		
41366	2				1		1		2			
41367	2				1				2			1[a]
41368	2				1				2			
41369	2				1				2			
41370	2			1	1				2			1
41371	2		2		1				2			
41372	2				1	1			2			
41373	2	2D			1				2		2	
41374	2				1				2			
41375	2				1		1		2	2		
TOTALS	250	26	26	20	125	13	13	11	250	26	26	14

[a] Indicated QC set will be sent to the QA Lab.

"D" indicates use of cartridge(s) spiked with deuterated compounds.

All Tenax duplicates will be collected on deuterated cartridges.

TABLE 49. LOS ANGELES 1 - COMPLETENESS OF SAMPLE COLLECTION AND ANALYSIS

	Samples Scheduled[a]/Collected (%)			
Sample Type	Personal Air	Fixed Air	Breath	Water
Field	250/234 (94%)	50/50 (100%)	125/117 (94%)	250/234 (94%)
D-Duplicate	26/24 (92%)	6/6 (100%)	13/12 (92%)	26/24 (92%)
Q-Duplicate	26/24 (92%)	6/6 (100%)	13/11 (85%)	26/24 (92%)

	Samples Scheduled[a]/Analyzed (%)			
Sample Type	Personal Air	Fixed Air	Breath	Water
Field	250/227 (91%)	50/50 (100%)	125/116 (93%)	250/228 (91%)
D-Duplicate	26/24 (92%)	6/6 (100%)	13/12 (92%)	26/24 (92%)
Q-Duplicate	26/24 (92%)	6/6 (100%)	13/11 (85%)	26/24 (92%)

[a] Based on projected 125 participants.

TABLE 50. SAMPLE RECEIPT REPORT

Prepared by: Karen Brady
Date: March 14, 1984
Sampling Trip: Los Angeles - 1

A. Sample Loss

Sample Code	Explanation
BR	
41289-0 BR-F	Respondent confined to a wheelchair
41348-4 BR-F	Respondent not home for final appointment
AV	
41333-6 AV-F2	Pump stopped during sampling
41348-4 AV-F2	Cartridge broken during collection. Respondent left pump outside home on table. No indication of how long it had been there.
WV	
41348-4 WV-F3	Respondent not home for final appointment
41289-0 WV-F2	Broken in shipment
41297-3 WV-F3	Broken in shipment
41327-8 WV-F2	Broken in shipment
41361-7 WV-F2	Broken in shipment

B. Other Comments

BR

41281-7 BR-F Cartridge cracked at void end: ANALYZABLE

Deviations from sampling schedule

41259-6 BR-D	Rescheduled	41260-1
41276-7 BR-D	Rescheduled	41275-9
41279-1 BR-Q	Rescheduled	41280-9
41289-0 BR-Q	Rescheduled	41290-8

XV

41295-7 XV-F2 Cap read AV-F2. Assuming caps switched when cartridges were collected.

Deviations from sampling schedule:

Fixed Site #14 (PSU 110) 41289-9 XV-Q2 & Q3 Rescheduled #13 (PSU 120) 41279-1

Fixed Site #14 XV-FB/FC-03 Rescheduled #13 (PSU 120) 41279-1

TABLE 50 (cont'd.)

AV

41295-7 AV-F2 Cap reads XV-F2. Assuming caps switched when cartridges were collected.

41362-5 AV-52 Cartridge cracked: ANALYZABLE

Deviations from sampling schedule:

41291-6 AV-Q1 & 2 Rescheduled because pump stopped on Qa collection. 41296-5.

413070-0 AV-FB/FC-11 Rescheduled 41303-9

41341-9 AV-Q1 & 2 Rescheduled 41346-8

WV

Deviations from sampling schedule:

41285-8 WV-FB/FC-05 SP Sheet labeled 41283-3, however the 41283-3 water samples were collected on the same day by the same team as 41285-8.

41355-9 WV-FB/FC-13 Rescheduled. Exposed the following day with 41362-5.

C. QA of SP/COC Sheets

Computational Errors	2	(Total Time Calculation)
[a]Noncomputation errors	13	

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[a] The majority of these errors occurred when an individual put different collection times on the front (SP) and back (COC). Times differed by only a few minutes.

Sample Analysis--

Tenax Cartridges--The air and breath collected during the first trip to Los Angeles were analyzed by capillary column gas chromatography/mass spectrometry/computer (GC/MS/COMP) employing procedures described in SOP No. 533-001 and 002. All matrix types were analyzed on the Finnigan 3300 quadrupole mass spectrometer on 41 analysis days between March 1 and April 23, 1984. Some of the personal air collections were analyzed on the Finnigan 4021 quadrupole system on 19 analysis days between April 2 and April 26, 1984.

Prior to sample analysis, relative response factors for each target compound were established by analyzing a minimum of seven cartridges containing known amounts of all the targets plus perfluorobenzene and perfluorotoluene (RRF cartridge). Based on this data, average RRF values were calculated and used to quantitate the volatile organic levels in samples collected from this sampling trip. This operation was carried out on each analytical system used (Finnigan 3300 and 4021 GC/MS/COMP).

An additional RRF cartridge was run during each sample analysis day and the agreement with the previously determired RRF value recorded. Note that the daily RRF was not used to quantitate target levels but only served as a check on the constancy of instrument performance. The RRF values used during this study and their variability are listed in Table 51. In addition, the instrument time was checked by measuring the intensity of perfluorotoluene (PFT) fragment ions relative to the base peak. The performance of the gas chromatography column was monitored for peak resolution and symmetry.

The PFT instrument tune was within the acceptable range on both instruments during the analysis period. Peak resolution and symmetry were also acceptable on both systems.

Water Samples--Water samples collected during the first trip to Los Angeles were analyzed by purge and trap gas chromatography between February 24 and March 30, 1984 during 25 analysis days. Samples were stored three to four weeks between collection and analysis.

Four multi-point calibration curves were generated periodically to give three composite curves which were used to quantitate target compounds in samples analyzed during each time interval.

TABLE 51. LOS ANGELES 1 - RELATIVE RESPONSE FACTOR (RRF) VALUES USED TO CALCULATE VOLATILE ORGANIC CONTENT ON TENAX CARTRIDGES

		Finnigan 3300				Finnigan 4021	
		3/1/84		3/2 - 4/23/84		4/2 - 4/25/84	
Target Compound	*m/z*	RRF	%CV	RRF	%CV	RRF	%CV
1,2-Dichloroethane	62	.304	14.6	.229	7.2	.679	18.2
	64	.090	15.3	.073	6.5	.219	18.5
1,1,1-Trichloroethane	61	.127	12.8	.111	6.2	.335	25.5
	97	.516	11.0	.414	4.5	.734	22.0
	99	.356	11.8	.283	5.2	.475	22.1
Benzene	78	1.315	12.7	1.028	12.1	2.321	24.1
Carbon tetrachloride	117	.575	13.1	.346	6.4	.578	22.9
	119	.532	13.7	.335	5.2	.566	22.6
Trichloroethylene	95	.579	9.5	.438	30.0	.806	18.2
	130	.812	8.7	.520	27.5	.858	17.8
	132	.707	8.5	.485	28.6	.809	17.8
Chloroform	83	.485	11.6	.606	6.6	.952	4.9
	85	.371	12.5	.449	8.2	.622	4.5
Bromodichloromethane	83	.703	15.4	.547	24.2	.775	18.6
	129	.132	17.9	.085	22.5	.085	18.2
p-Dioxane	58	.153	16.4	.145	36.2	.490	27.3
	88	.530	13.2	.368	24.0	.495	23.2
Dibromodichloromethane	127	.091	22.2	.250	18.7	.590	21.7
	129	.105	22.2	.297	16.8	.729	21.3
1,2-Dibromoethane	107	.098	30.7	.444	25.1	1.045	20.7
	109	.097	28.4	.450	27.1	.966	21.0
Tetrachloroethylene	164	.326	9.3	.522	10.1	.670	19.8
	166	.461	9.8	.706	11.7	.819	19.8
n-Octane	57	.078	32.4	.277	11.4	.978	15.9
	85	.177	16.6	.557	14.6	1.020	16.6
	114	.031	13.9	.090	18.1	.192	17.6
Chlorobenzene	77	.172	13.0	.719	16.8	1.469	14.4
	112	.409	18.5	1.637	18.3	2.760	14.5
	114	.137	20.2	.553	20.2	.880	14.5
Ethylbenzene	91	.012	14.6	1.618	11.9	3.469	14.7
	106	.189	14.2	.718	14.5	1.333	12.2
Bromoform	173	.205	19.9	.399	8.6	.538	20.3
p-Xylene	91	.801	17.7	1.514	6.5	2.913	14.9
	106	.349	15.9	.916	8.5	1.642	13.8
Styrene	104	.442	11.7	1.726	24.8	2.736	12.2
o-Xylene	91	1.122	16.4	1.301	8.6	2.393	12.1
	106	.544	18.3	.758	8.5	1.366	12.3
1,1,1,2-Tetrachloroethane	117	-	-	-	-	.513	20.6
	131	-	-	-	-	.577	20.9
	133	-	-	-	-	.539	20.9
1,1,2,2-Tetrachloroethane	83	.461	20.0	.540	9.4	1.444	20.9
	166	.041	12.8	.054	7.3	.105	19.3
	168	.049	11.3	.064	8.6	.130	19.6

(continued)

TABLE 51 (cont'd.)

		Finnigan 3300				Finnigan 4021	
		3/1/84		3/2 - 4/23/84		4/2 - 4/25/84	
Target Compound	m/z	RRF	%CV	RRF	%CV	RRF	%CV
α-Pinene							
	93	.287	16.3	.828	12.6	1.826	12.3
	121	.040	12.4	.108	15.0	.225	13.2
	136	.020	16.9	.072	14.1	.185	13.0
p-Dichlorobenzene							
	146	.451	11.2	1.273	6.6	1.869	21.3
	148	.273	11.9	.829	6.3	1.165	21.2
o-Dichlorobenzene							
	146	.558	10.2	1.033	7.6	1.754	13.9
	148	.334	11.0	.698	5.4	1.085	13.6
n-Undecane							
	57	.225	21.5	.772	7.7	2.676	14.3
	85	.123	15.3	.390	.49	.694	13.5
	156	.028	10.0	.079	11.0	.167	13.6
n-Dodecane							
	57	.250	20.4	.800	9.8	2.720	14.4
	85	.150	15.1	.464	9.7	.786	13.6
	170	.206	14.2	.066	9.1	-	-

Power failures resulted in the loss of data from 2 samples and one QC set.

Field Control and Blank QC Samples--

Tenax Cartridges--In general, the field control samples associated with the personal air collections gave blank-corrected recoveries of 80 to 120%. However, five target compounds were recovered in excessive amounts (130% to 150% of spike added) from Tenax batch number 74: chloroform; 1,2-dichloroethane; 1,1,1-trichloroethane; benzene; and trichloroethylene. A significant number of benzene-contaminated field blanks were observed (22, 28 ng). These personal air quality control results are shown in Table 52. Similar quality control data for breath and fixed site air matrices are listed in Tables 53 and 54, respectively.

Water Samples--Of the seven target compounds loaded in field controls, five exhibited recoveries between 78% and 88% (Table 55). Chlorobenzene (65%) and chlorodibromomethane (46%) recoveries were less. Only chloroform (persistently ubiquitous) was found in field blanks.

Duplicate Sample Analysis--

Tenax Cartridges--The agreement between duplicate sample pairs is summarized in Table 56 for the 20 target compounds found occasionally or frequently in measurable amounts in both the field (F) and corresponding duplicate (D) sample are listed. The percent relative standard deviation (%RSD) for those sample pairs was calculated, and the median, 75th percentile, and the maximum tabulated.

The agreement between duplicate pairs was very good. In nearly every case, the median %RSD was less than 30% and the 75th percentile value was less than 50%.

Except for chlorobenzene in personal air, *o*-dichlorobenzene and *n*-undecane in breath, and *o*-dichlorobenzene in fixed-site air samples, the precision of the remaining duplicate results was satisfactory.

Table 57 summarizes the interlaboratory precision between field samples and the corresponding Q-duplicates analyzed by the independent laboratory.

Water Samples--Water F/D sample pairs also gave good precision data (Table 58). Of the six target compounds found in measurable amounts, bromoform and 1,1,1-trichloroethane exhibited the highest variability. The independent laboratory results for Q-duplicates are shown in Table 59.

TABLE 52. LOS ANGELES 1 - PERSONAL AIR FIELD QC SAMPLES

	Field Controls (Tenax Batch 74/79)			Field Blanks (Tenax Batch 74/79)		
		Recovery[a]			Background, ng	
Target Compound	N	Mean	%RSD	N	Mean	%RSD
Chloroform	6/12	140/100	6/10	6/12	4/2	78/57
1,2-Dichloroethane	5/12	150/120	7/16	6/12	ND/ND[b]	-
1,1,1-Trichloroethane	6/12	140/120	4/14	6/12	3/7	85/143
Benzene	6/12	130/110	12/20	6/12	22/18	48/69
Carbon tetrachloride	6/12	110/88	23/17	6/12	ND/ND	-
Bromodichloromethane	NA[c]	-	-	NA	-	-
Trichloroethylene	6/12	130/100	25/18	6/12	ND/ND	-
p-Dioxane	6/10	120/86	23/44	6/12	ND/ND	-
Chlorodibromomethane	NA	-	-	NA	-	-
1,2-Dibromoethane	NA/5	-/82	-/16	6/12	ND/ND	-
n-Octane	6/10	120/97	20/15	6/12	ND/	-/
Tetrachloroethylene	6/12	120/96	19/18	6/12	ND/ND	-
Chlorobenzene	6/12	110/85	23/29	6/12	ND/ND	-
Ethylbenzene	6/10	110/93	13/18	6/12	ND/ND	-
Bromoform	NA	-	-	NA	-	-
p-Xylene	6/10	110/96	18/17	6/12	3/3	-
Styrene	6/10	86/86	14/24	6/12	3/8	30/68
o-Xylene	6/10	120/96	14/16	6/12	2/2	-
1,1,2,2-Tetrachloroethane	6/12	120/19	17/26	6/12	ND/ND	-
α-Pinene	6/10	110/85	17/23	6/12	ND/ND	-
p-Dichlorobenzene	6/10	97/81	17/15	6/11	6/8	146/114
m-Dichlorobenzene	NA	-	-	-	-	-
n-Decane	6/9	93/92	17/16	NA	-	-
o-Dichlorobenzene	6/10	110/95	16/18	6/12	3/4	117/82
n-Undecane	6/10	110/86	21/27	6/12	4/4	58/72
n-Dodecane	6/10	110/94	20/16	6/12	2/3	-
1,1,1,2-Tetrachloroethane	NA	-	-	6/12	ND/ND	-

[a] Corrected for background.

[b] ND = Not detected.

[c] NA = Not analyzed.

TABLE 53. LOS ANGELES 1 - BREATH FIELD QC SAMPLES

	Field Controls			Field Blanks (Spirometer)		
		Recovery			Background, ng	
Target Compound	N	Mean	%RSD	N	Mean	%RSD
Chloroform	7	84	20	9	8	130
1,2-Dichloroethane	7	105	22	9	ND[a]	-
1,1,1-Trichloroethane	7	106	13	9	10	80
Benzene	7	117	25	9	25	39
Carbon tetrachloride	7	80	12	9	ND	-
Bromodichloromethane	7	74	43	9	ND	-
Trichloroethylene	7	99	23	9	1	46
p-Dioxane	7	88	32	9	2	79
Chlorodibromomethane	5	92	35	9	ND	-
1,2-Dibromoethane	NA[a]	-	-	9	ND	-
n-Octane	7	97	19	9	ND	-
Tetrachloroethylene	7	100	8	9	2	37
Chlorobenzene	7	84	14	9	ND	-
Ethylbenzene	7	91	9	9	4	61
Bromoform	NA	-	-	9	ND	-
p-Xylene	7	89	9	9	6	33
Styrene	7	69	13	9	11	104
o-Xylene	7	99	13	9	3	40
1,1,2,2-Tetrachloroethane	7	110	12	9	ND	-
a-Pinene	7	82	20	9	ND	-
p-Dichlorobenzene	7	88	11	9	2	74
m-Dichlorobenzene	NA	-	-	NA	-	-
n-Decane	7	85	16	9	3	81
o-Dichlorobenzene	7	88	7	9	2	72
n-Undecane	7	88	21	9	4	55
n-Dodecane	7	92	19	9	ND	-
1,1,1,2-Tetrachloroethane	NA	-	-	9	ND	-

[a] ND = Not detected.

[b] NA = Not analyzed.

TABLE 54. LOS ANGELES 1 - FIXED SITE AIR FIELD QC SAMPLES

	Field Controls			Field Blanks		
		Recovery[a]			Background, ng	
Target Compound	N	Mean	%RSD	N	Mean	%RSD
Chloroform	4	124	8	4	2	43
1,2-Dichloroethane	4	128	18	4	ND	-
1,1,1-Trichloroethane	4	120	10	4	4	61
Benzene	4	111	23	4	12	25
Carbon tetrachloride	4	95	9	4	ND	-
Bromodichloromethane	NA	-	-	NA	-	-
Trichloroethylene	4	99	9	4	1	0
p-Dioxane	4	101	12	4	ND	-
Chlorodibromomethane	NA	-	-	NA	-	-
1,2-Dibromoethane	NA	-	-	4	ND	-
n-Octane	4	102	14	4	2	71
Tetrachloroethylene	4	100	11	4	ND	-
Chlorobenzene	4	84	21	4	ND	-
Ethylbenzene	4	87	19	4	2	71
Bromoform	NA	-	-	NA	-	-
p-Xylene	4	66	61	4	5	77
Styrene	4	67	13	4	4	89
o-Xylene	4	99	13	4	2	67
1,1,2,2-Tetrachloroethane	4	102	12	4	ND	-
a-Pinene	4	65	68	4	ND	-
p-Dichlorobenzene	4	87	8	4	ND	-
m-Dichlorobenzene	NA	-	-	NA	-	-
n-Decane	4	86	13	4	6	35
o-Dichlorobenzene	4	88	11	4	3	106
n-Undecane	4	90	14	4	5	43
n-Dodecane	4	95	3	4	2	38
1,1,1,2-Tetrachloroethane	NA	-	-	4	ND	-

[a] Corrected for background.

ND = Not detected.

NA = Not analyzed.

TABLE 55. LOS ANGELES 1 - WATER FIELD QC SAMPLES

	Field Controls			Field Blanks		
		Recovery[a]			Background, ng/mL	
Target Compound	N	Mean	%RSD	N	Mean	%RSD
Chloroform	12	86	16	11	1.0	18
1,2-Dichloroethane	NA[b]	-	-	NA	-	-
1,1,1-Trichloroethane	12	88	18	11	ND[c]	-
Benzene	NA	-	-	NA	-	-
Carbon tetrachloride	NA	-	-	NA	-	-
Bromodichloromethane	12	72	27	11	ND	-
Trichloroethylene	12	86	14	11	ND	-
p-Dioxane	NA	-	- -	NA	-	-
Chlorodibromomethane	12	46	56	11	ND	-
1,2-Dibromoethane	NA	-	-	NA	-	-
n-Octane	NA	-	-	NA	-	-
Tetrachloroethylene	12	78	16	11	ND	-
Chlorobenzene	12	65	15	11	ND	-
Ethylbenzene	NA	-	-	NA	-	-
Bromoform	NA	-	-	NA	-	-
p-Xylene	NA	-	-	NA	-	-
Styrene	NA	-	-	NA	-	-
o-Xylene	NA	-	-	NA	-	-
1,1,2,2-Tetrachloroethane	NA	-	-	NA	-	-
α-Pinene	NA	-	-	NA	-	-
p-Dichlorobenzene	NA	-	-	NA	-	-
m-Dichlorobenzene	NA	-	-	NA	-	-
n-Decane	NA	-	-	NA	-	-
o-Dichlorobenzene	NA	-	-	NA	-	-
n-Undecane	NA	-	-	NA	-	-
n-Dodecane	NA	-	-	NA	-	-
1,1,1,2-Tetrachloroethane	NA	-	-	NA	-	-

[a] Corrected for background.

[b] NA = Not analyzed.

[c] ND = Not detected.

TABLE 56. LOS ANGELES 1 - DUPLICATE SAMPLES (AV, BR, XV) PERCENT RELATIVE STANDARD DEVIATION (%RSD) FOR F/D RESULTS

	Personal Air, %RSD			Breath, %RSD			Fixed Site Air, %RSD		
Target Compound	Median (N)	75% tile	Max.	Median (N)	75% tile	Max.	Median (N)	75% tile	Max.
Chloroform	28 (21)	56	107	25 (3)	51	51	34 (5)	49	60
1,2-Dichloroethane	12 (14)	20	31	- (0)	-	-	9 (1)	-	-
1,1,1-Trichloroethane	8 (23)	22	111	11 (12)	20	96	18 (6)	18	44
Benzene	13 (23)	21	113	20 (12)	44	76	6 (6)	12	16
Carbon tetrachloride	15 (21)	30	63	7 (2)	-	9	28 (6)	29	71
Trichloroethylene	12 (17)	24	54	10 (7)	15	44	9 (5)	14	38
Tetrachloroethylene	12 (19)	16	63	15 (11)	26	35	21 (5)	22	39
Styrene	28 (21)	43	96	24 (3)	104	104	20 (5)	35	37
p-Dichlorobenzene	30 (21)	49	110	11 (8)	16	47	9 (5)	12	32
Ethylbenzene	13 (21)	26	123	26 (8)	49	72	12 (5)	13	31
o-Xylene	13 (22)	25	130	14 (11)	21	38	17 (6)	19	27
p-Xylene	15 (23)	24	116	20 (12)	26	64	13 (6)	13	71
n-Decane	12 (19)	32	110	26 (6)	32	53	24 (5)	29	30
n-Dodecane	13 (23)	35	113	19 (4)	20	27	37 (5)	40	42
1,4-Dioxane	20 (6)	21	65	- (0)	-	-	8 (3)	11	11
n-Octane	11 (21)	39	141	4 (9)	6	32	20 (6)	22	58
n-Undecane	15 (23)	35	114	51 (7)	61	123	24 (5)	30	33
α-Pinene	14 (22)	23	121	11 (8)	14	72	9 (3)	69	69

TABLE 57. LOS ANGELES 1 - DUPLICATE SAMPLES (AV, BR, XV) PERCENT RELATIVE STANDARD DEVIATION (%RSD) FOR F/Q RESULTS

	Personal Air, %RSD			Breath, %RSD			Fixed Site Air, %RSD		
Target Compound	Median (N)	75% tile	Max.	Median (N)	75% tile	Max.	Median (N)	75% tile	Max.
Chloroform	90 (21)	100	130	130 (3)	140	140	120 (5)	130	130
1,2-Dichloroethane	20 (3)	20	100	- (0)	-	-	- (1)	-	19
1,1,1-Trichloroethane	- (0)	-	-	- (0)	-	-	- (0)	-	-
Benzene	29 (22)	87	110	37 (8)	71	98	18 (6)	47	86
Carbon tetrachloride	29 (10)	46	50	- (0)	-	-	- (1)	-	4.2
Trichloroethylene	30 (19)	55	92	53 (4)	90	100	6.8 (4)	24	28
Tetrachloroethylene	22 (22)	75	100	24 (11)	46	68	39 (6)	77	100
Styrene	24 (17)	33	96	9.4 (2)	-	10	20 (6)	37	57
p-Dichlorobenzene	73 (17)	100	130	37 (3)	62	62	42 (5)	43	44
Ethylbenzene	35 (21)	60	120	30 (6)	49	50	21 (6)	50	92
o-Xylene	27 (22)	60	130	2.5 (3)	20	20	34 (6)	54	99
p-Xylene	26 (21)	65	120	12 (8)	58	75	17 (6)	51	89
n-Decane	- (0)	-	-	- (0)	-	-	- (0)	-	-
n-Dodecane	52 (18)	68	140	- (0)	-	-	52 (5)	83	98
1,4-Dioxane	28 (4)	37	40	- (0)	-	-	- (1)	-	26
n-Octane	39 (22)	63	120	- (0)	-	-	18 (5)	85	87
n-Undecane	51 (18)	78	130	- (0)	-	-	56 (5)	100	100
a-Pinene	17 (14)	38	94	32 (9)	53	57	11 (2)	-	12
Chlorobenzene	- (0)	-	-	- (0)	-	-	- (0)	-	-
o-Dichlorobenzene	- (0)	-	-	- (0)	-	-	- (0)	-	-

TABLE 58. LOS ANGELES 1 - PERCENT RELATIVE STANDARD DEVIATION (%RSD) FOR F/D RESULTS OF DUPLICATE WATER SAMPLES

	Water, %RSD		
Target Compound	Median (n)	75th Percentile	Max.
Chloroform	6 (16)	10	27
1,1,1-Trichloroethane	17 (10)	52	74
Bromodichloromethane	4 (17)	9	133
Dibromochloromethane	4 (16)	9	29
Tetrachloroethylene	2 (1)	-	-
Bromoform	13 (12)	33	42

TABLE 59. LOS ANGELES 1 - PERCENT RELATIVE STANDARD DEVIATION (%RSD) FOR F/Q RESULTS OF DUPLICATE WATER SAMPLES

	Water, %RSD		
Target Compound	Median (n)	75th Percentile	Max.
Chloroform	22 (17)	32	40
Bromodichloromethane	22 (17)	40	52
Dibromochloromethane	31 (17)	43	53
Bromoform	42 (5)	59	67

Performance Audit Sample Analysis--

Tenax Cartridges--Performance audit samples were prepared by fortifying Tenax cartridges with selected aromatic and aliphatic target compounds. The Tenax for all audit samples was supplied by RTI and fortified by EMSL/EPA-RTP.

The analysis of the audit cartridges were carried out blind; each cartridge was given a legitimate study number and a chain-of-custody form before being introduced into the sample chain. The results were reported to EPA without any background correction and are summarized in Table 60.

Approximately equal numbers of targets exhibited a positive and negative bias. Trichloroethylene (+43.7%) and benzene (+31.2%) had the highest positive bias; ethylbenzene (-25.0%) and bromoform (-22.7%) showed the highest negative bias. Precision estimates were poorest for bromoform and best for chloroform and carbon tetrachloride.

A set of four audit samples were prepared at RTI and submitted to the independent laboratory for analysis. Their results are shown in Table 61.

Water Samples--The water QA data are shown in Table 62. Target compound measurement in the audit samples provided by EPA, Cincinnati indicated low recoveries. This was particularly true for bromoform (17% and 23% recoveries from sample QC-1 and QC-2, respectively). Blanks were analyzed and reported as devoid of all target compounds.

Second Trip

Field Operations--

The second collection of environmental and biological samples in the greater Los Angeles area was performed between May 21 and June 2, 1984. Some equipment had been stored in the area after the first trip. These materials and other sampling supplies sent from RTI were located in a workroom at the Holiday Inn in Torrance, California. No system audit was performed at the sampling site. The description of the field activities presented below is based on personal interviews with members of the analytical sampling staff.

Sample collection was accomplished by two two-person teams. All of the sampling personnel were experienced, each having participated in at least three previous field collections.

TABLE 60. LOS ANGELES 1 - PERFORMANCE AUDIT SAMPLE RESULTS, VOLATILE ORGANICS

Target Compound	N	Amount Added, ng	Mean Bias, %	% RSD of Bias Data
Chloroform	6	150-350	12.6	14.8
1,1,2,2-Tetrachloroethane	11	300-700	-14.6	38.2
1,1,1-Trichloroethane	6	400-800	17.7	18.1
Carbon tetrachloride	6	300	9.9	16.0
Trichloroethylene	11	150-650	43.7	38.5
Tetrachloroethylene	10[a]	150-650	12.2	23.2
Bromoform	11	150-700	-22.7	46.2
Chlorobenzene	10[a]	100-650	-16.7	28.0
Benzene	11	125-600	31.2	27.8
Ethylbenzene	10[a]	100-650	-25.0	18.8
o-Xylene	11	125-600	-13.5	17.6

[a] Not included in this presentation is one audit sample in which the target compound was not detected.

TABLE 61. LOS ANGELES 1 - PERFORMANCE AUDIT SAMPLE RESULTS, VOLATILE ORGANICS ON TENAX, INDEPENDENT LABORATORY[a]

Sample Code Analyte	Quantity on Cartridge, ng												
	XVFC03			AVFC04			AVC07			BRFC09			
	Spiked	Found	%Bias	Spiked	Found	%Bias	Spiked	Found	%Bias	Spiked	Found	%Bias	Mean % Bias
Chloroform	124.00	122.00	-1.61	125.00	138.00	10.40	124.00	188.00	51.61	125.00	561.00	348.80	102.30
1,2-Dichloroethane	348	493	41.67	349	462	32.38	348	628	80.46	349	348	-.27	38.55
1,1,1-Trichloroethane	184	0	-100.00	183	0	-100.00	184	0	-100.00	183	0	-100.00	-100.00
Benzene	324	513	58.33	327	369	12.84	324	426	31.48	327	374	14.37	29.26
Carbon tetrachloride	217	528	143.32	218	430	97.25	217	471	117.05	218	372	70.64	107.06
Trichloroethylene	424	813	97.75	423	608	43.74	424	766	80.66	423	572	35.22	62.84
Bromodichloromethane	0	0	--	0	0	---	0	0	---	397	229	-42.17	-10.54
Dibromochloromethane	0	0	---	0	60.2	---	0	0	---	244	152	-37.70	-9.43
Tetrachloroethylene	48	493	41.67	352	413	17.33	348	472	35.63	352	363	3.13	24.44
Chlorobenzene	141	190	34.75	142	104	-26.76	141	238	68.79	142	143	.70	19.37
Bromoform	0	0	---	0	0	---	0	0	---	289	125	-56.75	-14.19
Styrene	182	397	118.13	182	182	.00	182	365	100.55	182	203	11.54	57.55
m-Dichlorobenzene	0	681	---	0	347	---	0	667	---	0	439	---	.00
p-Dichlorobenzene	48	0	-100.00	148	78.44	-47.03	148	7.9	-94.66	148	0	-100.00	-85.42
o-Dichlorobenzene	261	378	44.83	261	211	-19.26	261	192	-26.44	261	240	-8.05	-2.20
Ethylbenzene	174	377	116.67	174	187	7.47	174	414	137.93	174	414	137.93	100.00
o,p-Xylene	348	519	19.14	348	247	-29.02	348	612	75.86	348	424	21.84	29.45
m-Xylene	0	215	---	0	128	---	0	257	---	0	153	---	.00
Decane	146	0	-100.00	146	0	-100.00	146	0	-100.00	146	0	-100.00	-100.00
Dodecane	150	243	62.00	150	110	-26.67	150	258	72.00	150	153	2.00	27.33
p-Dioxine	206	208	.97	206	140	-39.81	206	199	-3.40	206	102	-50.49	-23.18
1,2-Dibromoethane	0	0	---	0	0	---	0	0	---	105	69.3	-34.00	-8.50
Octane	0	180	---	140	136	-2.86	140	200	42.86	140	116	-17.14	5.71
Undecane	148	251	69.59	148	143	-3.38	148	348	135.14	148	184	24.32	56.42
Tetrachloroethane	0	627	---	498	425	-14.66	0	496	---	498	453	-9.04	-5.92
α-Pinene	172	193	12.21	172	87.6	-49.07	172	153	-11.05	172	85.2	-50.47	-24.59
Mean			32.41			-11.58			25.72			2.68	10.23
Mean (absolute value)			69.71			25.18			50.58			47.28	38.68

[a] Cartridges were spiked at RTI and identified to the laboratory as control samples.

TABLE 62. LOS ANGELES 1 - PERFORMANCE AUDIT SAMPLE RESULTS - WATER ANALYSIS

	Sample QC-1 (N=2)		Sample QC-2 (N=2)	
Target Compound	Conc., µg/L	%Recovery	Conc., µg/L	%Recovery
Chloroform	5.90	54	33.4	73
1,1,1-Trichloroethane	0.43	39	7.85	56
Trichloroethylene	1.57	60	9.70	75
Bromodichloromethane	1.36	80	6.52	76
Dibromochloromethane	1.18	49	5.94	50
Tetrachloroethylene	0.55	50	3.32	59
Bromoform	0.47	17	2.40	23

The participant identification numbers reserved for this Los Angeles study were 42251 to 42300. Each number was followed by a computer-generated check digit. The first two numbers indicate that the sampling was conducted during the second trip of the fourth year of the study. The last three digits were unique and descriptive for this sampling trip and were utilized as the participant identification number.

A sample collection schedule (Table 63) was prepared at the start of the study. The schedule identified the participants from whom D-type and Q-type duplicates were to be collected. It also indicated the time at which matrix field controls and blanks (QC sets) were scheduled for exposure. The frequency of duplicate collections and QC set exposure were based on guidelines issued by the Project Director and incorporated into the schedule such that the additional burden on the participant and analytical staff was minimal.

The participants were selected from the 117 individuals enlisted during the first trip. The design of this study required the collection of samples from 50 former participants. This was accomplished plus the sampling of two additional individuals who were not originally scheduled. The completion figures for the collection and analysis of samples from the 52 individuals in this study are shown in Table 64. A sample receipt report is shown in Table 65.

The methodology employed during the field operations was described in a series of standard operating procedures (see Table 46). It was ascertained from analytical staff interviews that the approved SOPs were properly implemented at the collection site.

Sample Analysis--

Tenax Cartridges--The air and breath collected during the second trip to Los Angeles were analyzed by capillary column gas chromatography/mass spectrometry/computer (GC/MS/COMP) employing procedures described in SOP No. 553-001 and 002. Personal and fixed air samples were analyzed on the Finnigan 3300 quadrupole system on 20 analysis days between June 7 and July 3, 1984. Some of the fixed-site air and all of the breath collections were analyzed on the Finnigan 4021 quadrupole system on 13 analysis days between June 14 and June 28, 1984.

TABLE 63. LOS ANGELES 2 - SAMPLE COLLECTION SCHEDULE PARTIAL LISTING

	AV (Batch No.)				BR (Batch No.)				WV			
Participant No.	F	D	Q	QC	F	D	Q	QC	F	D	Q	QC
42251	2		2		1				2			
42252	2				1				2			
42253	2	2D		1	1				2		2	
42254	2				1				2			
42255	2				1				2	2		1
42256	2				1	1D		1	2			
42257	2				1				2			
42258	2				1				2			
42259	2				1		1		2			
42260	2			1	1				2			
42261	2		2		1				2			
42262	2				1				2			
42263	2	2D			1				2		2	
42264	2				1				2			
42265	2				1				2	2		1
-----			----				----				----	
-----			----				----				----	
-----			----				----				----	
-----			----				----				----	
42286	2				1	1D			2			
42287	2				1				2			1[a]
42288	2			1	1				2			
42289	2				1		1		2			
42290	2				1				2			
42291	2		2	1[a]	1				2			
42292	2				1				2			
42293	2	2D		1	1				2	2		
42294	2				1				2			
42295	2				1				2	2		1
42296	2				1	1D		1	2			
42297	2				1				2			
42298	2				1				2			
42299	2				1		1		2			
42300	2			1	1				2			
TOTALS	100	10	10	9	50	5	5	4	100	10	10	6

[a] Indicated QC set will be sent to the QA Lab.
"D" indicates use of cartridge(s) spiked with deuterated compounds.
All Tenax duplicates will be collected on deuterated cartridges.

TABLE 64. LOS ANGELES 2 - COMPLETENESS OF SAMPLE COLLECTION AND ANALYSIS

	Samples Scheduled[a]/Collected (%)			
Sample Type	Personal Air	Fixed Air	Breath	Water
Field	104/104 (100%)	48/48 (100%)	52/51 (98%)	104/104 (100%)
D-Duplicate	10/10 (100%)	5/5 (100%)	5/4 (80%)	10/10 (100%)
Q-Duplicate	10/10 (100%)	5/4 (100%)	5/4 (80%)	10/10 (100%)

	Samples Scheduled[a]/Analyzed (%)			
Sample Type	Personal Air	Fixed Air	Breath	Water
Field	104/104 (100%)	48/47 (98%)	52/51 (98%)	104/103 (99%)
D-Duplicate	10/10 (100%)	5/5 (100%)	5/4 (80%)	10/10 (100%)
Q-Duplicate	10/10 (100%)	5/4 (80%)	5/4 (80%)	10/10 (100%)

[a] Based on the actual 52 study respondents.

TABLE 65. LOS ANGELES 2 - SAMPLE RECEIPT REPORT

Prepared by: Pat Blau

Date: June 5 and 14, 1984

Sample Trip: Los Angeles - 2

Sample Code	Explanation
42279-0 BR-Q	Broken cartridge
42293-1 AV-F2	Broken Kimax tube, replaced upon receipt at RTI
42262-6 BR-F	Not collected; health-related problem
425-9 WV-FB7	Samples received but no SP/COC sheets. Received 6/14/84
430302-0 42303-8	All samples were collected but not scheduled.

Prepared by: Kent Thomas

Date: June 6, 1984

Sample Trip: Los Angeles - 2

Sample Code	Explanation
42251 AV-Q1	Lost. Rescheduled for participant No. 42284
42253 AV-F1	Lost. The designated F1 and F2 samples were destroyed. The D-duplicates for this participant were relabeled F-samples. The D-duplicates rescheduled for participant No. 42266.
42262 BR-F	Not collected.
42281 AV-F1	Lost. The designated F1 and F2 samples were destroyed. The Q-duplicates for this participant were relabled F-sampled. The Q-duplicates rescheduled for participant No. 42298.
42287	AV-QC set scheduled during collection of 42291 was exposed instead for 42287.

Prior to sample analysis, relative response factors for each target compound were established by analyzing a minimum of seven cartridges containing known amounts of all the targets plus perfluorobenzene and perfluorotoluene (RRF cartridge). Based on this data, average RRF values were calculated and used to quantitate the volatile organic levels in samples collected from this sampling trip. This operation was carried out on each analytical system used (Finnigan 3300 and 4021 GC/MS/COMP).

An additional RRF cartridge was run during each sample analysis day and the agreement with the previously determined RRF value recorded. Note that the daily RRF was not used to quantitate target levels but only served as a check on the constancy of instrument performance. The RRF values used during this study and their variability are listed in Table 66. In addition, the instrument tune was checked by measuring the intensity of perfluorotoluene (PFT) fragment ions relative to the base peak. The performance of the gas chromatography column was monitored for peak resolution and symmetry.

The PFT tune was within the acceptable range on both instruments during the analysis period. Peak resolution and symmetry were also acceptable on both systems.

Water Samples--Water samples collected during the second trip to Los Angeles were analyzed by purge and trap gas chromatography between June 14 and July 18, 1984 during 16 analysis days. Samples were stored three to six weeks between collection and analysis.

Four multi-point calibration curves were generated periodically to give three composite curves which were used to quantitate target compounds in samples analyzed during each time interval.

The data from one sample was lost due to a program malfunction.

Field Control and Blank QC Samples--

Tenax Cartridges--Tenax batch number 85 used for personal air sampling gave excellent target recovery from field controls (Table 67). Only chloroform (130%) and 1,1,2,2-tetrachloroethane (140%) fell outside of an 85-120% recovery range and only benzene exhibited a significant background level.

On the other hand, the Tenax used in breath cartridges (batch number 81) was characterized by nine target recoveries below 80% (Table 68). Significantly,

TABLE 66. LOS ANGELES 2 - RELATIVE RESPONSE FACTOR (RRF) VALUES USED TO CALCULATE VOLATILE ORGANICS CONTENT ON TENAX CARTRIDGES

		Finnigan 3300				Finnigan 4021	
		6/7 - 6/5/84		6/6 - 7/2/84		6/14 - 6/28/84	
Target Compound	m/z	RRF	%CV	RRF	%CV	RRF	%CV
1,2-Dichloroethane	62	.786	5.8	.594	10.6	.723	14.3
	64	.222	6.0	.187	12.8	.247	12.1
1,1,1-Trichloroethane	61	.237	12.3	.230	12.8	.333	13.2
	97	.583	12.3	.664	10.3	.727	9.5
	99	.360	12.4	.446	11.3	.464	9.5
Benzene	78	1.902	10.3	1.549	7.5	1.542	12.1
Carbon tetrachloride	117	.597	10.6	.568	9.4	.628	7.5
	119	.578	10.6	.578	8.4	.589	7.5
Trichloroethylene	95	.874	14.4	.499	8.4	.515	16.7
	130	.793	12.5	.532	11.6	.563	16.1
	132	.777	12.9	.511	8.1	.535	16.9
Chloroform	83	1.265	10.3	1.069	13.1	1.239	9.6
	85	.795	9.1	.750	12.4	0.806	9.6
Bromodichloromethane	83	.674	36.0	.619	11.0	.371	18.7
	129	.023	58.8	.028	32.4	.479	17.7
p-Dioxane	58	.258	38.4	.143	21.6	1.211	27.5
	88	.408	39.8	.242	20.0	1.515	30.7
Dibromodichloromethane	127	.054	60.8	.250	38.7	1.052	16.1
	129	.074	55.5	.342	39.2	.982	15.6
1,2-Dibromoethane	107	.116	33.3	.232	25.1	1.052	12.2
	109	.111	31.8	.223	29.0	.982	11.8
Tetrachloroethylene	164	.440	10.7	.452	14.2	.752	8.9
	166	.519	9.4	.563	11.0	.868	9.3
n-Octane	57	.326	19.2	.289	19.5	.862	9.0
	85	.373	13.5	.369	20.3	.903	7.8
	114	.039	11.5	.307	17.6	.179	6.5
Chlorobenzene	77	.725	13.2	.889	16.0	1.320	12.2
	112	1.169	13.4	1.520	15.1	2.191	10.2
	114	.434	13.0	.463	16.7	.749	10.9
Ethylbenzene	91	1.427	14.7	1.833	14.6	2.423	10.7
	106	.496	16.2	.599	14.2	1.123	10.1
Bromoform	173	.042	56.4	.255	40.4	1.044	8.6
p-Xylene	91	1.340	15.9	1.705	13.9	2.154	10.4
	106	.558	18.2	.086	13.7	1.123	8.3
Styrene	104	.842	19.9	1.177	18.0	2.024	6.4
o-Xylene	91	1.746	15.4	1.705	13.1	1.925	10.0
	106	.721	14.6	.683	12.4	1.203	8.4
1,1,1,2-Tetrachloroethane	117	.233	18.2	.267	20.0	.454	8.4
	131	.315	17.4	.370	19.3	.590	6.9
	133	.301	17.5	.346	19.0	.549	6.9
1,1,2,2-Tetrachloroethane	83	.923	20.5	.837	12.9	.984	13.0
	166	.039	20.9	.042	10.3	.088	11.4
	168	.053	20.7	.053	10.4	.111	11.5

(continued)

TABLE 66 (cont'd.)

		Finnigan 3300				Finnigan 4021	
		3/1/84		3/2 - 4/23/84		4/2 - 4/25/84	
Target Compound	*m/z*	RRF	%CV	RRF	%CV	RRF	%CV
a-Pinene	93	.055	18.1	.078	13.1	1.416	4.3
	121	.028	20.5	.031	14.2	.204	6.1
	136	.594	13.9	.621	13.6	.173	6.4
p-Dichlorobenzene	146	1.223	13.9	1.165	14.7	1.504	10.0
	148	.849	14.3	.800	13.2	1.009	6.8
n-Decane	57	1.038	15.4	1.076	16.2	1.870	10.4
	85	.275	28.7	.403	26.7	.658	7.9
	142	.036	12.2	.038	14.6	.171	7.9
o-Dichlorobenzene	146	1.088	13.2	1.056	13.7	1.440	9.7
	148	.754	13.3	.739	13.1	.967	6.5
n-Undecane	57	1.067	17.4	1.086	16.8	1.767	1.42
	85	.287	13.4	.326	16.5	.538	8.7
	156	.030	15.4	.032	14.0	.164	9.7
n-Dodecane	57	1.106	17.7	1.099	11.1	1.843	9.4
	85	.378	15.1	.387	13.6	.619	5.1
	170	.026	15.3	.027	12.5	.157	4.7
m-Dichlorobenzene	146	.718	10.9	1.053	9.4	2.282	4.9
	148	.487	11.2	.737	9.5	1.415	5.1

TABLE 67. LOS ANGELES 2 - PERSONAL AIR FIELD QC SAMPLES

	Field Controls (Tenax Batch 85)			Field Blanks (Tenax Batch 85)		
		% Recovery[a]			Background, ng	
Target Compound	N	Mean	%RSD	N	Mean	%RSD
Chloroform	7	130	10	6	11	46
1,2-Dichloroethane	7	110	10	6	ND[b]	-
1,1,1-Trichloroethane	7	120	16	6	6	28
Benzene	7	90	8	6	31	30
Carbon tetrachloride	7	100	13	6	ND	-
Bromodichloromethane	NA[c]	-	-	NA	-	-
Trichloroethylene	7	100	8	6	ND	-
p-Dioxane	6	110	25	6	5	126
Chlorodibromomethane	NA	-	-	NA	-	-
1,2-Dibromoethane	7	110	24	6	ND	-
n-Octane	7	110	26	6	ND	-
Tetrachloroethylene	7	100	21	6	ND	-
Chlorobenzene	7	99	15	6	ND	-
Ethylbenzene	7	100	26	6	5	55
Bromoform	NA	-	-	NA	-	-
p-Xylene	7	110	24	6	5	42
Styrene	7	100	32	6	13	76
o-Xylene	7	110	20	6	3	-
1,1,2,2-Tetrachloroethane	7	140	15	6	9	87
α-Pinene	7	86	21	6	ND	-
p-Dichlorobenzene	7	110	21	6	3	75
m-Dichlorobenzene	7	110	13	6	ND	-
n-Decane	7	110	20	6	ND	-
o-Dichlorobenzene	7	110	21	6	4	92
n-Undecane	7	110	27	6	ND	-
n-Dodecane	7	110	22	6	ND	-
1,1,1,2-Tetrachloroethane	7	100	23	6	3	82

[a] Corrected for background.

[b] ND = Not detected.

[c] NA = Not analyzed.

TABLE 68. LOS ANGELES 2 - BREATH FIELD QC SAMPLES

	Field Controls (Tenax Batch 81)			Field Blanks (Tenax Batch 81)[a]		
		% Recovery			Background, ng	
Target Compound	N	Mean	%RSD	N	Mean	%RSD
Chloroform	4	45	15	4	14	53
1,2-Dichloroethane	4	87	11	4	ND[b]	-
1,1,1-Trichloroethane	6	71	12	6	8	102
Benzene	4	77	41	4	36	105
Carbon tetrachloride	4	56	8	4	ND	-
Bromodichloromethane	4	48	28	4	ND	-
Trichloroethylene	4	120	17	4	4	130
p-Dioxane	4	64	32	4	ND	-
Chlorodibromomethane	4	42	16	4	ND	-
1,2-Dibromoethane	4	74	18	4	ND	-
n-Octane	4	88	13	4	7	33
Tetrachloroethylene	4	91	8	4	10	111
Chlorobenzene	4	86	7	4	ND	-
Ethylbenzene	4	98	7	4	3	-
Bromoform	4	46	6	4	ND	-
p-Xylene	4	95	4	4	8	59
Styrene	4	97	7	4	6	39
o-Xylene	4	97	4	4	6	30
1,1,2,2-Tetrachloroethane	4	110	5	4	ND	-
α-Pinene	4	80	15	4	2	-
p-Dichlorobenzene	4	98	6	4	6	82
m-Dichlorobenzene	4	90	9	4	ND	-
n-Decane	4	94	11	4	9	24
o-Dichlorobenzene	4	100	6	4	ND	-
n-Undecane	4	91	12	4	13	13
n-Dodecane	6	95	8	4	7	20
1,1,1,2-Tetrachloroethane	4	92	7	4	ND	-

[a] Spirometer blanks.

[b] ND = Not detected.

four of the nine compounds had recoveries between 42% and 48%. Once again, measurable amounts of benzene were found in field blanks.

The field controls containing the Tenax batch used to prepare fixed site air cartridges exhibited recoveries below 80% for a total of 13 target compounds (Table 69). Eleven of the 13 compounds had recoveries below 60%. Field blanks had relatively high levels of chloroform and benzene.

Water Samples--All of the target compounds in the water field controls gave low recoveries (26% to 72% of added spike). Except for low 1,1,1-trichloroethane and trichloroethylene background levels, the water blanks were devoid of all target compounds (see Table 70).

Duplicate Sample Analysis--

Tenax Cartridges--The agreement between the duplicate sample pairs is summarized in Table 71. In general, the calculated precision estimates were very acceptable. Excluding the single *p*-dichlorobenzene pair in one of the breath duplicates, only two targets in each matrix exceeded a 30% median RSD: breath-benzene (51.7%) and *p*-xylene (32.6%); personal air-trichloroethylene (47.1%) and styrene (40.3%) and fixed-site air - chloroform (44%) and *o*-xylene (44.6%). The agreement between Q-type duplicates is shown in Table 72.

Water Samples--The results of the duplicate water analysis is shown in Table 73. The agreement observed between F and D samples is excellent for the 7 listed target compounds. The agreement between F and Q samples is shown in Table 74.

Performance Audit Sample Results--

Tenax Cartridges--Only three audit samples plus one blank were analyzed with the second trip Los Angeles breath and air samples (Table 75). They were introduced into the sample chain at the end of this work and during the start of the Contra Costa analysis. Because of delays in obtaining the performance samples from EPA and difficulties experienced in loading the cartridges, no audit samples were sent to the independent laboratory during the Los Angeles 2 and Contra Costa analysis.

In general, recoveries of the target compounds in audit samples nos. 107 and 110 were between 70% and 110%. Chlorobenzene recoveries tended to be low. On the other hand, bromoform and trichloroethylene exhibited erratic behavior. Except for chloroform, targets on cartridge no. 108 showed elevated recoveries,

TABLE 69. LOS ANGELES 2 - FIXED SITE AIR FIELD QC SAMPLES

	Field Controls (Tenax Batch 82)			Field Blanks (Tenax Batch 82)		
		% Recovery[a]			Background, ng	
Target Compound	N	Mean	%RSD	N	Mean	%RSD
Chloroform	4	92	13	4	23	41
1,2-Dichloroethane	4	110	4	4	ND[b]	-
1,1,1-Trichloroethane	4	130	27	4	6	33
Benzene	4	120	19	4	38	11
Carbon tetrachloride	4	92	20	4	ND	-
Bromodichloromethane	NA[c]	-	-	NA	-	-
Trichloroethylene	4	110	34	4	2	-
p-Dioxane	4	44	68	4	ND	-
Chlorodibromomethane	NA	-	-	NA	-	-
1,2-Dibromoethane	4	140	31	4	ND	-
n-Octane	4	56	53	4	6	56
Tetrachloroethylene	4	100	11	4	ND	-
Chlorobenzene	4	98	19	4	ND	-
Ethylbenzene	4	59	58	4	2	-
Bromoform	NA	-	-	NA	-	-
p-Xylene	4	61	58	4	5	53
Styrene	4	47	75	4	ND	-
o-Xylene	4	62	64	4	2	-
1,1,2,2-Tetrachloroethane	4	110	18	4	2	-
α-Pinene	4	39	71	4	ND	-
p-Dichlorobenzene	4	58	68	4	ND	-
m-Dichlorobenzene	4	98	25	4	ND	-
n-Decane	4	54	67	4	4	-
o-Dichlorobenzene	4	54	68	4	ND	-
n-Undecane	4	46	67	4	3	-
n-Dodecane	4	46	74	4	3	-
1,1,1,2-Tetrachloroethane	4	51	66	4	ND	-

[a] Corrected for background.

[b] ND = Not detected.

[c] NA = Not analyzed.

TABLE 70. LOS ANGELES 2 - WATER FIELD QC SAMPLES

	Field Controls			Field Blanks		
		% Recovery[a]			Background, ng/mL	
Target Compound	N	Mean	%RSD	N	Mean	%RSD
Chloroform	6	72	10	6	ND[b]	-
1,2-Dichloroethane	NA[c]	-	-	NA	-	-
1,1,1-Trichloroethane	6	71	13	6	0.10	16
Benzene	NA	-	-	NA	-	-
Carbon tetrachloride	NA	-	-	NA	-	-
Bromodichloromethane	6	58	10	6	ND	-
Trichloroethylene	6	68	11	6	0.06	15
p-Dioxane	NA	-	-	NA	-	-
Chlorodibromomethane	6	26	12	6	ND	-
1,2-Dibromoethane	NA	-	-	NA	-	-
n-Octane	NA	-	-	NA	-	-
Tetrachloroethylene	6	67	11	6	ND	-
Chlorobenzene	6	56	12	6	ND	-
Ethylbenzene	NA	-	-	NA	-	-
Bromoform	6	28	13	6	ND	-
p-Xylene	NA	-	-	NA	-	-
Styrene	NA	-	-	NA	-	-
o-Xylene	NA	-	-	NA	-	-
1,1,2,2-Tetrachloroethane	NA	-	-	NA	-	-
α-Pinene	NA	-	-	NA	-	-
p-Dichlorobenzene	NA	-	-	NA	-	-
m-Dichlorobenzene	NA	-	-	NA	-	-
n-Decane	NA	-	-	NA	-	-
o-Dichlorobenzene	NA	-	-	NA	-	-
n-Undecane	NA	-	-	NA	-	-
n-Dodecane	NA	-	-	NA	-	-
1,1,1,2-Tetrachloroethane	NA	-	-	NA	-	-

[a] Corrected for background.

[b] ND = Not detected.

[c] NA = Not analyzed.

TABLE 71. LOS ANGELES 2 - DUPLICATE SAMPLES (AV, BR, XV) PERCENT RELATIVE STANDARD DEVIATION (%RSD) FOR F/D RESULTS

	Personal Air, %RSD			Breath, %RSD			Fixed Site Air, %RSD		
Target Compound	Median (N)	75% tile	Max.	Median (N)	75% tile	Max.	Median (N)	75% tile	Max.
Chloroform	30 (4)	41	89	- (0)	-	-	40 (2)	-	68
1,2-Dichloroethane	21 (3)	40	40	- (0)	-	-	- (0)	-	-
1,1,1-Trichloroethane	22 (10)	25	67	13 (5)	32	34	25 (5)	48	54
Benzene	13 (9)	23	114	52 (3)	128	128	10 (5)	26	58
Carbon tetrachloride	9 (9)	16	42	14 (1)	-	-	17 (5)	18	51
Trichloroethylene	47 (5)	[illegible]	106	24 (2)	-	24	- (0)	-	-
Tetrachloroethylene	14 (10)	29	33	28 (5)	36	39	12 (4)	20	64
Styrene	40 (8)	52	83	- (0)	-	-	27 (2)	-	49
p-Dichlorobenzene	16 (9)	19	71	45 (1)	-	-	27 (1)	-	-
Ethylbenzene	10 (10)	21	32	- (0)	-	-	27 (5)	37	37
o-Xylene	11 (9)	17	35	- (0)	-	-	45 (5)	46	48
p-Xylene	10 (10)	26	71	33 (5)	60	73	18 (5)	20	31
n-Decane	11 (6)	12	39	- (0)	-	-	14 (1)	-	-
n-Dodecane	20 (2)	-	25	- (0)	-	-	6 (1)	-	-
1,4-Dioxane	- (0)	-	-	- (0)	-	-	- (0)	-	-
n-Octane	19 (9)	27	52	- (0)	-	-	20 (1)	-	-
n-Undecane	17 (7)	20	71	- (0)	-	-	26 (1)	-	-
α-Pinene	20 (7)	24	87	25 (5)	30	47	22 (1)	-	-

TABLE 72. LOS ANGELES 2 - DUPLICATE SAMPLES (AV, BR, XV) PERCENT RELATIVE STANDARD DEVIATION (%RSD) FOR F/Q RESULTS

	Personal Air, %RSD			Breath, %RSD			Fixed Site Air, %RSD		
Target Compound	Median (N)	75% tile	Max.	Median (N)	75% tile	Max.	Median (N)	75% tile	Max.
Chloroform	62 (5)	104	107	119 (2)	-	134	98 (1)	-	-
1,2-Dichloroethane	91 (1)	-	-	- (0)	-	-	- (0)	-	-
1,1,1-Trichloroethane	- (0)	-	-	- (0)	-	-	- (0)	-	-
Benzene	27 (9)	46	63	58 (4)	96	98	45 (4)	87	97
Carbon tetrachloride	16 (10)	28	50	- (0)	-	-	58 (3)	81	81
Trichloroethylene	17 (6)	31	34	117 (2)	-	133	- (0)	-	-
Tetrachloroethylene	13 (10)	32	50	35 (4)	101	114	37 (4)	68	76
Styrene	49 (9)	59	93	81 (1)	-	-	33 (4)	53	58
p-Dichlorobenzene	69 (10)	86	116	32 (4)	39	39	40 (4)	81	93
Ethylbenzene	32 (10)	57	71	19 (3)	98	98	-	-	-
o-Xylene	26 (10)	62	81	79 (3)	84	84	28 (4)	49	5540
p-Xylene	22 (10)	36	57	52 (4)	75	77	26 (4)	39	40
n-Decane	- (0)	-	-	- (0)	-	-	- (0)	-	-
n-Dodecane	85 (6)	95	97	21 (1)	-	-	- (0)	-	-
1,4-Dioxane	24 (2)	-	29	- (0)	-	-	- (0)	-	-
n-Octane	24 (8)	51	58	41 (1)	-	-	16 (4)	23	24
n-Undecane	57 (7)	69	91	35 (2)	-	40	32 (2)	-	33
α-Pinene	28 (10)	50	63	38 (4)	50	51	48 (2)	-	50

TABLE 73. LOS ANGELES 2 - PERCENT RELATIVE STANDARD DEVIATION (%RSD) FOR F/D RESULTS ON DUPLICATE WATER SAMPLES

Target Compound	Water, %RSD		
	Median (n)	75th Percentile	Max.
Chloroform	1 (10)	4	12
1,1,1-Trichloroethane	4 (1)	-	-
Trichloroethylene	7 (8)	9	17
Bromodichloromethane	3 (10)	3	7
Dibromochloromethane	3 (10)	4	8
Tetrachloroethylene	7 (10)	10	23
Bromoform	8 (10)	10	16

TABLE 74. LOS ANGELES 2 - PERCENT RELATIVE STANDARD DEVIATION (%RSD) FOR F/D RESULTS ON DUPLICATE WATER SAMPLES

	Water, %RSD		
Target Compound	Median (n)	75th Percentile	Max.
Chloroform	18 (6)	26	36
Trichloroethylene	138 (1)	-	-
Bromodichloromethane	42 (6)	50	57
Dibromochloromethane	54 (6)	69	75

TABLE 75. LOS ANGELES 2/CONTRA COSTA - PERFORMANCE AUDIT SAMPLE RESULTS - VOLATILE ORGANICS

	Cartridge Number						
	107		108		110		
Target Compound	Found, ng	Added, ng	Found, ng	Added, ng	Found, ng	Added, ng	Mean Recovery, %
Chloroform	354	486	633	723	332	482	76.6
1,1,2,2-Tetrachloroethane	374	519	1134	779	414	419	99.3
1,1,1-Trichloroethane	423	435	1071	653	391	435	117.
Carbon tetrachloride	413	519	1171	779	426	419	104.
Trichloroethylene	575	476	990	714	338	476	110.
Tetrachloroethylene	375	531	1179	797	302	531	91.8
1,2-Dibromoethane	401	408	854	612	322	408	106.
Bromoform	229	563	2013	885	654	563	128.
Chlorobenzene	239	360	743	540	258	360	92.0
Benzene	340	286	533	429	253	286	110.
Ethylbenzene	211	282	891	423	305	282	131.
o-Xylene	238	286	715	425	273	286	116.
Mean Recovery, %	83.0		154		83.9		107.

124% to 228%. It might be argued that this behavior was due to the use of contaminated Tenax; however, significant background levels of all the targets on a single cartridge is highly improbable. The high recoveries were more likely due to a misloading during audit sample preparation or to a gross mishandling of the analytical raw data for this cartridge. A blank audit cartridge using the same Tenax was also analyzed; only benzene (26 ng) and chloroform (19 ng) were detectable.

Water Samples--The results of the performance audit sample analyses carried out at this time are described in the Contra Costa section of this report.

CONTRA COSTA

Field Operations

The collection of environmental and biological samples in Contra Costa county was carried out between June 4 and 25, 1984. Sampling supplies and equipment were transported by van to the site immediately after the completion of the Los Angeles sampling. All equipment and materials were stored in a workroom at the Holiday Inn in Concord/Walnut Creek. A system audit was performed at the sampling site by the RTI QA officer between June 22 and June 25, 1984. The description of the field activities presented below is based on the results of this audit and personal interviews with members of the analytical sampling staff.

Sample collection was accomplished by four, two-person teams. Two teams were at the site during each of the two, 11-day sampling periods. Each team was made up of experienced individuals who had participated in at least three previous field collections.

The participant identification numbers reserved for the Contra Costa study were 42901 through 42975. Each number was followed by a computer-generated check digit. The first two numbers indicate that the sampling was conducted during the second trip of the fourth year of the study. The last three digits were unique and descriptive for this sampling trip and were utilized as the participant identification number.

A sample collection schedule (Table 76) was prepared at the start of the study. The schedule identified the participants from whom D-type and Q-type duplicates were to be collected. It also indicated the time at which matrix

TABLE 76. CONTRA COSTA - SAMPLE COLLECTION SCHEDULE - PARTIAL LISTING

	AV (Batch No.)				BR (Batch No.)				WV			
Participant No.	F	D	Q	QC	F	D	Q	QC	F	D	Q	QC
42901	2		2		1				2			
42902	2				1				2			
42903	2	2D		1	1				2		2	
42904	2				1				2			
42905	2				1				2	2		1
42906	2				1	1D		1	2			
42907	2				1				2			
42908	2				1				2			
42909	2				1		1		2			
42910	2			1	1				2			
42911	2		2		1				2			
42912	2				1				2			
42913	2	2D			1				2		2	
42914	2				1				2			
42915	2				1				2	2		1
-----			----				----				----	
-----			----				----				----	
-----			----				----				----	
-----			----				----				----	
42961	2		2		1				2			
42962	2				1				2			
42963	2	2D			1				2		2	
42964	2			1	1D				2			
42965	2				1				2	2		1
42966	2				1	1D			2			
42967	2				1				2			
42968	2				1				2			
42969	2				1		1		2			
42970	2				1				2			
42971	2		2	1	1				2			
42972	2				1				2			
42973	2	2D			1			1	2		2	
42974	2				1				2			
42975	2				1				2	2		1
TOTALS	150	16	16	12	75	7	7	7	150	16	16	9

[a] Indicated QC set will be sent to the QA Lab.
"D" indicates use of cartridge(s) spiked with deuterated compounds.
All Tenax duplicates will be collected on deuterated cartridges.

field controls and blanks (QC sets) were scheduled for exposure. The frequency of duplicate collections and QC set exposure were based on guidelines issued by the Project Director and incorporated into the schedule such that the additional burden on the participant and analytical sampling staff was minimal.

The study participants were selected from twenty primary sampling units. One set (2-8 to 12 hour samples) of fixed-site air collections were scheduled at the household of the first sampled participant residing in each unit. Duplicate collections were scheduled at two locations; quality assurance samples (Q-duplicates) were obtained at one additional residence.

Projections for the Contra Costa study included the recruitment and sampling of seventy-five participants. However, only seventy-one individuals, or 94.7% of the projected number, were enlisted as respondents and utilized for sampling purposes. The corresponding completion figures for sample collection and analysis are shown in Table 77. A sample receipt report is given in Table 78 (others may be found in Appendix K).

The methodology employed during the field operations was described in a series of standard operating procedures (SOPs) (see Table 46). It was ascertained from the on-site audit and staff interviews that the approved SOPs were properly implemented at the collection site.

Documentation on samples provided to QA laboratories is given in Appendix L.

Sample Analysis

Tenax Cartridges--

The air and breath collected in Contra Costa country were analyzed by capillary column gas chromatography/mass spectrometry/computer (GC/MS/COMP) employing procedures described in SOP No. 533-001 and 002. Personal and fixed site air samples were analyzed on the Finnigan 3300 quadrupole system on 16 analysis days between July 3 and July 25, 1984. Most of the personal air collections were analyzed on the Finnigan 4021 quadrupole system on 20 analysis days between June 28 and July 25, 1984.

Prior to sample analysis, relative response factors for each target compound were established by analyzing a minimum of seven cartridges containing known amounts of all the targets plus perfluorobenzene and perfluorotoluene (RRF cartridge). Based on this data, average RRF values were calculated and used to quantitate the volatile organic levels in samples collected from this

TABLE 77. CONTRA COSTA - COMPLETENESS OF SAMPLE COLLECTION AND ANALYSIS

	Samples Scheduled[a]/Collected (%)			
Sample Type	Personal Air	Fixed Air	Breath	Water
Field	150/142 (95%)	20/20 (100%)	75/71 (95%)	150/142 (95%)
D-Duplicate	16/14 (88%)	4/4 (100%)	7/8 (100%)	16/14 (88%)
Q-Duplicate	16/16 (100%)	2/2 (100%)	7/7 (100%)	16/14 (88%)

	Samples Scheduled[a]/Analyzed (%)			
Sample Type	Personal Air	Fixed Air	Breath	Water
Field	150/138 (92%)	20/20 (100%)	75/69 (92%)	150/142 (95%)
D-Duplicate	16/14 (88%)	4/4 (100%)	7/8 (100%)	16/14 (88%)
Q-Duplicate	16/16 (100%)	2/2 (100%)	7/7 (100%)	16/14 (88%)

[a] Based on projected 75 participants.

TABLE 78. CONTRA COSTA SAMPLE RECEIPT REPORT

Prepared by:	Pat Blau
Date:	7/16/84
Sample Trip:	Contra Costa County, CA

Sample Code	Explanation
42960-5 BR-F	Cartridge cracked
42934-0 AV-F2	Cartridge broken during sampling
42950-6 AV-F2	Pump failure in field
42935-7 WV-D2,D3	Sample bottles labelled Q2 and Q3 were changed to D2 and D3
42946-4 BR-D	No deuterated standards were loaded
42944-9 XV-Q1,Q2	Not collected

sampling trip. This operation was carried out on each analytical system used (Finnigan 3300 and 4021 GC/MS/COMP).

An additional RRF cartridge was run during each sample analysis day, and the agreement with the previously determined RRF value recorded. Note that the daily RRF was not used to quantitate target levels but only served as a check on the constancy of instrument performance. The RRF values used during this study and their variability are listed in Table 79. In addition, the instrument tune was checked by measuring the intensity of perfluorotoluene (PFT) fragment ions relative to the base peak. The performance of the gas chromatography column was monitored for peak resolution and symmetry.

The PFT tune was within the acceptable range on both instruments during the analysis period. Peak resolution and symmetry were also acceptable on both systems.

Water Samples--

Water samples collected during the trip to Contra Costa county were analyzed by purge and trap gas chromatography between July 19 and August 2, 1984 during 11 analysis days. Samples were stored 10 days to three weeks between collection and analysis.

Three multi-point calibration curves were generated periodically to give two composite curves which were used to quantitate target compounds in samples analyzed during each time interval.

Power failures resulted in the loss of data from 2 samples and one QC set (field blank and control).

Field Control and Blank QC Samples

Tenax Cartridges--

The field QC sample results for breath, personal and fixed-site air collections are shown in Tables 80-82. The amounts of blank contamination and the recoveries from spiked control cartridges were related to Tenax batch number.

Personal air cartridges which were prepared from Tenax batch numbers 87 and 89 were characterized by low recoveries of 4 target compounds (carbon tetrachloride; p-dioxane; 1,2-dibromoethane; and m-dichlorobenzene) and significant chloroform and benzene blank levels. Tenax batch number 80, used to prepare cartridges for breath collection, exhibited low recoveries (52-71%)

TABLE 79. CONTRA COSTA - RELATIVE RESPONSE FACTOR (RRF) VALUES USED TO CALCULATE VOLATILE ORGANIC CONTENT ON TENAX CARTRIDGES

		Finnigan 3300				Finnigan 4021	
		7/3 - 7/10/84		7/11 - 7/25/84		6/28 - 7/25/84	
Target Compound	m/z	RRF	%CV	RRF	%CV	RRF	%CV
1,2-Dichloroethane	62	.594	10.6	.743	6.9	.723	14.3
	64	.187	12.8	.219	6.7	.247	12.1
1,1,1-Trichloroethane	61	.230	12.8	.350	8.4	.333	13.2
	97	.664	10.3	.706	9.2	.727	9.5
	99	.446	11.3	.431	9.4	.464	9.5
Benzene	78	1.549	7.5	2.547	4.6	1.542	12.1
Carbon tetrachloride	117	.568	9.4	.565	4.5	.628	7.5
	119	.578	8.4	.560	4.1	.589	7.5
Trichloroethylene	95	.499	8.4	.687	7.6	.515	16.7
	130	.532	11.6	.632	6.9	.563	16.1
	132	.511	8.1	.563	7.1	.535	16.9
Chloroform	83	1.069	13.1	1.081	7.9	1.239	9.6
	85	.750	12.4	.738	7.0	.806	9.6
Bromodichloromethane	83	.619	11.0	1.135	7.9	1.256	18.7
	129	.028	32.4	.031	39.1	.157	17.7
p-Dioxane	58	.143	21.6	.215	18.4	.371	27.5
	88	.242	20.0	.347	22.4	.479	30.7
Dibromodichloromethane	127	.250	38.7	.795	28.8	1.211	16.1
	129	.342	39.1	1.074	29.4	1.515	15.6
1,2-Dibromoethane	107	.232	25.1	.678	30.2	1.052	12.2
	109	.223	29.0	.598	29.7	.982	11.8
Tetrachloroethylene	164	.452	14.2	.634	15.3	.742	8.9
	166	.563	11.0	.868	15.7	.868	9.3
n-Octane	57	.289	19.5	.560	14.3	.862	9.0
	85	.369	20.3	.741	12.2	.903	7.8
	114	.037	17.6	.029	20.0	.179	6.5
Chlorobenzene	77	.889	16.0	1.337	9.4	1.320	12.2
	112	1.520	15.1	2.287	8.3	2.191	10.2
	114	.463	16.7	.636	10.2	.749	10.9
Ethylbenzene	91	1.833	14.6	3.546	7.8	2.423	10.7
	106	.599	14.2	1.137	17.4	1.132	10.1
Bromoform	173	.255	40.4	.805	11.9	1.044	8.6
p-Xylene	91	1.705	13.9	3.090	7.7	2.154	10.4
	106	.686	13.7	1.160	7.6	1.341	8.3
Styrene	104	1.177	18.0	1.996	6.5	2.024	6.4
o-Xylene	91	1.705	13.1	2.695	6.9	1.925	10.0
	106	.683	12.4	.995	6.2	1.203	8.4
1,1,1,2-Tetrachloroethane	117	.267	20.0	.497	12.0	.454	8.4
	131	.370	19.3	.606	6.2	.590	6.9
	133	.346	19.0	.614	5.8	.549	6.9
1,1,2,2-Tetrachloroethane	83	.837	12.9	1.206	5.5	.984	13.0
	166	.042	10.3	.058	6.6	.088	11.4
	168	.053	10.4	.071	6.6	.111	11.5

(continued)

TABLE 79 (cont'd.)

		Finnigan 3300				Finnigan 4021	
		3/1/84		3/2 - 4/23/84		4/2 - 4/25/84	
Target Compound	*m*/*z*	RRF	%CV	RRF	%CV	RRF	%CV
α-Pinene	93	.621	13.6	.876	10.0	1.416	4.3
	121	.078	13.1	.114	10.5	.204	6.1
	136	.031	14.2	.052	11.0	.173	6.4
p-Dichlorobenzene	146	1.165	14.7	1.696	5.5	1.504	10.0
	148	.800	13.2	1.182	5.7	1.009	6.8
n-Decane	57	1.076	16.2	2.163	10.3	1.870	10.4
	85	.403	26.7	.565	12.8	.658	7.9
	142	.038	14.6	.076	9.9	.171	7.9
o-Dichlorobenzene	146	1.056	13.7	1.591	5.5	1.440	9.7
	148	.739	13.1	1.089	5.5	.967	6.5
n-Undecane	57	1.086	16.8	2.130	11.8	1.767	14.2
	85	.326	16.5	.667	18.8	.538	8.7
	156	.032	14.0	.066	11.4	.164	9.7
n-Dodecane	57	1.099	11.1	2.290	8.6	1.843	9.4
	85	.387	13.6	.795	9.3	.619	5.1
	170	.027	12.5	.057	11.7	.157	4.7
m-Dichlorobenzene	146	1.053	9.4	1.729	5.6	2.282	4.9
	148	.737	9.5	1.196	5.5	1.415	5.1

TABLE 80. CONTRA COSTA - PERSONAL AIR FIELD QC SAMPLES

	Field Controls (Tenax Batch (87/89)			Field Blanks (Tenax Batch 87/89)		
		% Recovery[a]			Background, ng	
Target Compound	N	Mean	%RSD	N	Mean	%RSD
Chloroform	5/4	80/100	4/15	5/4	23/58	27/44
1,2-Dichloroethane	5/4	99/100	9/15	5/4	ND/ND[b]	-
1,1,1-Trichloroethane	5/4	93/100	7/16	5/4	8/7	94/77
Benzene	5/4	110/120	4/11	5/4	22/17	14/14
Carbon tetrachloride	5/4	68/76	13/14	5/4	ND/ND	-
Bromodichloromethane	NA[c]	-	-	NA	-	-
Trichloroethylene	5/4	100/120	9/17	5/4	1/1	-
p-Dioxane	5/4	65/85	24/14	5/4	ND/ND	-
Chlorodibromomethane	NA	-	-	NA	-	-
1,2-Dibromoethane	5/4	72/74	19/34	5/4	ND/ND	-
n-Octane	5/4	91/86	15/38	5/4	2/2	-
Tetrachloroethylene	5/4	86/78	15/30	5/4	1/3	-
Chlorobenzene	5/4	85/94	15/16	5/4	1/1	-
Ethylbenzene	5/4	91/100	14/2	5/4	2/2	-
Bromoform	NA	-	-	NA	-	-
p-Xylene	5/4	90/100	13/2	5/4	2/2	-
Styrene	5/4	87/98	15/2	5/4	8/2	101/29
o-Xylene	5/4	96/110	12/2	5/4	2/2	-
1,1,2,2-Tetrachloroethane	5/4	82/88	32/16	5/4	ND/ND	-
a-Pinene	5/4	79/87	17/8	5/4	ND/ND	-
p-Dichlorobenzene	5/4	88/100	18/6	5/4	2/3	-
m-Dichlorobenzene	5/4	69/82	40/21	5/4	1/2	-
n-Decane	5/4	91/93	18/11	5/4	2/3	-
o-Dichlorobenzene	5/4	85/97	21/8	5/4	5/6	50/88
n-Undecane	5/4	87/92	33/14	5/4	2/2	-
n-Dodecane	5/4	80/90	46/14	5/4	2/2	-
1,1,1,2-Tetrachloroethane	5/4	82/95	14/8	5/4	ND/ND	-

[a] Corrected for background.

[b] ND = Not detected.

[c] NA = Not analyzed.

TABLE 81. CONTRA COSTA - BREATH FIELD QC SAMPLES

	Field Controls (Tenax Batch 80)			Field Blanks (Tenax Batch 80)[a]		
		% Recovery			Background, ng	
Target Compound	N	Mean	%RSD	N	Mean	%RSD
Chloroform	3	200	39	3	29	120
1,2-Dichloroethane	3	110	10	3	ND[b]	-
1,1,1-Trichloroethane	3	100	16	3	36	118
Benzene	3	100	6	3	15	54
Carbon tetrachloride	3	90	10	3	ND	-
Bromodichloromethane	3	52	9	3	ND	-
Trichloroethylene	3	97	4	3	2	-
p-Dioxane	3	100	7	3	5	125
Chlorodibromomethane	3	64	4	3	ND	-
1,2-Dibromoethane	3	130	2	3	ND	-
n-Octane	3	100	2	3	4	79
Tetrachloroethylene	3	100	3	3	7	75
Chlorobenzene	3	100	11	3	ND	-
Ethylbenzene	3	93	2	3	4	66
Bromoform	3	52	6	3	ND	-
p-Xylene	3	95	3	3	9	78
Styrene	3	92	3	3	7	66
o-Xylene	3	95	2	3	5	80
1,1,2,2-Tetrachloroethane	3	100	7	3	8	152
α-Pinene	3	90	6	3	ND	-
p-Dichlorobenzene	3	81	17	3	4	130
m-Dichlorobenzene	3	100	18	3	ND	-
n-Decane	3	71	43	3	4	74
o-Dichlorobenzene	3	98	1	3	4	130
n-Undecane	3	98	1	3	8	45
n-Dodecane	3	100	6	3	4	42
1,1,1,2-Tetrachloroethane	3	96	5	3	3	121

[a] Spirometer blanks.

[b] ND = Not detected.

TABLE 82. CONTRA COSTA - FIXED SITE AIR FIELD QC SAMPLES

	Field Controls (Tenax Batch 88)			Field Blanks (Tenax Batch 88)		
		% Recovery[a]			Background, ng	
Target Compound	N	Mean	%RSD	N	Mean	%RSD
Chloroform	3	180	41	3	32	42
1,2-Dichloroethane	3	160	56	3	ND	-
1,1,1-Trichloroethane	3	170	43	3	8	33
Benzene	3	110	56	3	4	133
Carbon tetrachloride	3	140	62	3	ND	-
Bromodichloromethane	NA[c]	-	-	NA	-	-
Trichloroethylene	3	130	41	3	ND	-
p-Dioxane	3	110	27	3	ND	-
Chlorodibromomethane	NA	-	-	NA	-	-
1,2-Dibromoethane	3	110	32	3	ND	-
n-Octane	3	100	21	3	3	33
Tetrachloroethylene	3	120	29	3	ND	-
Chlorobenzene	3	95	8	3	ND	-
Ethylbenzene	3	110	8	3	ND	-
Bromoform	NA	-	-	NA	-	-
p-Xylene	3	110	9	3	2	-
Styrene	3	110	10	3	3	58
o-Xylene	3	150	44	3	ND	-
1,1,2,2-Tetrachloroethane	3	130	15	3	ND	-
α-Pinene	3	94	20	3	ND	-
p-Dichlorobenzene	3	160	60	3	ND	-
m-Dichlorobenzene	3	110	7	3	ND	-
n-Decane	3	130	37	3	3	-
o-Dichlorobenzene	3	150	46	3	ND	-
n-Undecane	3	160	49	3	2	66
n-Dodecane	3	150	44	3	ND	-
1,1,1,2-Tetrachloroethane	3	94	25	3	ND	-

[a] Corrected for recovery.

[b] ND = Not detected.

[c] NA = Not analyzed.

for four target compounds: bromodichloromethane, dibromochloromethane, bromoform and decane. Chloroform and 1,1,1-trichloroethane background levels were elevated. Finally, Tenax batch number 88, used for fixed-site air sampling, showed excessively high recoveries for 10 target compounds (130% to 180% of added spike) and a relatively high chloroform background.

Water Samples--

All of the target compounds in the water field controls gave low recoveries, 47% to 62% of added spike (Table 83). Except for a low 1,1,1-trichloroethane background level, the water blanks were devoid of all target compounds.

Duplicate Sample Analysis

Tenax Cartridges--

The agreement between duplicate sample pairs is summarized in Table 84. In general, the precision was very good. With few exceptions, the personal air and breath median %RSD was 25% or less and the 75th percentile %RSD was 55% or less. Targets not falling within these bounds were breath 1,1,1-trichloroethane and personal air benzene, trichloroethylene, and styrene. Fixed-site air data were difficult to evaluate because of the limited number of duplicate pairs which contained measurable target levels.

Table 85 summarizes the interlaboratory precision between field samples and the corresponding Q-duplicates analyzed by the independent laboratory.

Water Samples--

Water F/D sample pairs also gave good precision data (Table 86). Except for the one 1,1,1-trichloroethane pair, the median %RSD for all measurable targets was less than 10%. The F/Q samples results are shown in Table 87.

Performance Audit Sample Analysis

Tenax Cartridges--

The Tenax audit sample introduced during the Contra Costa analysis are described in the Los Angeles, second trip section of this report.

Water Samples--

The water QA data generated during the analysis of the second trip Los Angeles and Contra Costa samples are shown in Table 88. Chloroform and dibromodichloromethane recoveries tend to be high; bromoform exhibited low recoveries. Low background levels were reported for chloroform, chlorobenzene, and tetrachloroethylene.

TABLE 83. CONTRA COSTA - WATER FIELD QC SAMPLES

	Field Controls			Field Blanks		
		% Recovery[a]			Background, ng	
Target Compound	N	Mean	%RSD	N	Mean	%RSD
Chloroform	7	62	16	8	ND[b]	-
1,2-Dichloroethane	NA[c]	-	-	NA	-	-
1,1,1-Trichloroethane	7	53	26	8	.06	69
Benzene	NA	-	-	NA	-	-
Carbon tetrachloride	NA	-	-	NA	-	-
Bromodichloromethane	7	50	19	8	ND	-
Trichloroethylene	7	55	21	8	ND	-
p-Dioxane	NA	-	-	NA	-	-
Chlorodibromomethane	7	47	25	8	ND	-
1,2-Dibromoethane	NA	-	-	NA	-	-
n-Octane	NA	-	-	NA	-	-
Tetrachloroethylene	7	51	22	8	ND	-
Chlorobenzene	7	53	11	8	ND	-
Ethylbenzene	NA	-	-	NA	-	-
Bromoform	3	47	16	7	ND	-
p-Xylene	NA	-	-	NA	-	-
Styrene	NA	-	-	NA	-	-
o-Xylene	NA	-	-	NA	-	-
1,1,2,2-Tetrachloroethane	NA	-	-	NA	-	-
α-Pinene	NA	-	-	NA	-	-
p-Dichlorobenzene	NA	-	-	NA	-	-
m-Dichlorobenzene	NA	-	-	NA	-	-
n-Decane	NA	-	-	NA	-	-
o-Dichlorobenzene	NA	-	-	NA	-	-
n-Undecane	NA	-	-	NA	-	-
n-Dodecane	NA	-	-	NA	-	-
1,1,1,2-Tetrachloroethane	NA	-	-	NA	-	-

[a] Corrected for background.

[b] ND = Not detected.

[c] NA = Not analyzed.

TABLE 84. CONTRA COSTA - DUPLICATE SAMPLES (AV, BR, XV) PERCENT RELATIVE STANDARD DEVIATION (%RSD) FOR F/D RESULT

	Personal Air, %RSD			Breath, %RSD			Fixed Site Air, %RSD		
Target Compound	Median (N)	75% tile	Max.	Median (N)	75% tile	Max.	Median (N)	75% tile	Max.
Chloroform	26 (4)	30	32	- (0)	-	-	111 (1)	-	-
1,1,1-Trichloroethane	19 (13)	34	93	43 (14)	56	69	45 (3)	-	54
Benzene	46 (14)	63	103	18 (5)	34	95	11 (2)	-	12
Carbon tetrachloride	12 (12)	32	54	- (1)	-	-	43 (1)	-	-
Trichloroethylene	54 (7)	61	76	- (0)	-	-	- (0)	-	-
Tetrachloroethylene	13 (13)	39	116	18 (5)	52	123	- (0)	-	-
Styrene	41 (8)	45	62	17 (5)	18	47	- (0)	-	-
p-Dichlorobenzene	21 (7)	23	93	25 (3)	37	37	- (0)	-	-
Ethylbenzene	15 (13)	20	110	6 (5)	7	13	29 (2)	-	53
o-Xylene	11 (14)	22	110	14 (4)	24	30	35 (2)	-	47
p-Xylene	9 (14)	21	104	15 (6)	22	123	37 (2)	-	56
n-Decane	9 (8)	10	16	8 (3)	16	16	17 (1)	-	-
n-Dodecane	11 (5)	19	20	- (0)	-	-	- (0)	-	-
n-Octane	19 (12)	40	82	3 (1)	-	-	- (0)	-	-
n-Undecane	7 (10)	12	60	7 (2)	-	12	- (0)	-	-
a-Pinene	10 (10)	21	64	19 (4)	33	58	- (0)	-	-
o-Dichlorobenzene	24 (1)	-	-	-	-	-	- (0)	-	-

TABLE 85. CONTRA COSTA - DUPLICATE SAMPLES (AV, BR, XV) PERCENT RELATIVE STANDARD DEVIATION (%RSD) FOR F/Q RESULTS

	Personal Air, %RSD			Breath, %RSD			Fixed Site Air, %RSD		
Target Compound	Median (N)	75% tile	Max.	Median (N)	75% tile	Max.	Median (N)	75% tile	Max.
Chloroform	100 (7)	114	127	- (0)	-	-	133 (1)	-	-
1,2-Dichloroethane	29 (3)	81	81	- (0)	-	-	- (0)	-	-
1,1,1-Trichloroethane	- (0)	-	-	- (0)	-	-	- (0)	-	-
Benzene	16 (15)	41	88	36 (6)	85	88	18 (2)	-	18
Carbon tetrachloride	39 (12)	47	63	- (0)	-	-	- (0)	-	-
Trichloroethylene	30 (11)	63	74	80 (2)	-	134	- (0)	-	-
Tetrachloroethylene	31 (15)	59	110	97 (3)	98	98	- (0)	-	-
Styrene	16 (13)	30	64	54 (1)	-	-	- (0)	-	-
p-Dichlorobenzene	28 (9)	47	99	26 (6)	47	47	- (0)	-	-
Ethylbenzene	24 (14)	65	108	46 (3)	54	54	- (0)	-	-
o-Xylene	26 (15)	40	100	47 (2)	-	52	69 (1)	-	-
p-Xylene	17 (15)	52	84	36 (5)	48	56	47 (2)	-	64
n-Decane	- (0)	-	-	- (0)	-	-	- (0)	-	-
n-Dodecane	44 (9)	58	113	- (0)	-	-	- (0)	-	-
1,4-Dioxane	65 (1)	-	-	- (0)	-	-	- (0)	-	-
n-Octane	32 (15)	90	107	26 (1)	-	-	- (0)	-	-
n-Undecane	34 (13)	63	107	20 (2)	-	30	- (0)	-	-
α-Pinene	26 (10)	62	100	17 (4)	35	41	- (0)	-	-

TABLE 86. CONTRA COSTA - PERCENT RELATIVE STANDARD DEVIATION (%RSD) FOR F/D RESULTS ON DUPLICATE WATER SAMPLES

	Water, %RSD		
Target Compound	Median (n)	75th Percentile	Max.
Chloroform	9 (14)	15	49
1,1,1-Trichloroethane	57 (1)	-	-
Trichloroethylene	3 (13)	6	21
Bromodichloromethane	3 (10)	15	46
Dibromochloromethane	6 (10)	10	38
Tetrachloroethylene	3 (11)	4	7
Bromoform	5 (9)	7	22

TABLE 87. CONTRA COSTA - PERCENT RELATIVE STANDARD DEVIATION (%RSD) FOR F/Q RESULTS ON DUPLICATE WATER SAMPLES

	Water, %RSD		
Target Compound	Median (n)	75th Percentile	Max.
Chloroform	32 (13)	41	63
Bromodichloromethane	49 (9)	58	71
Dibromochloromethane	19 (7)	21	29

TABLE 88. CONTRA COSTA/LOS ANGELES 2 - PERFORMANCE AUDIT SAMPLE RESULTS - WATER ANALYSIS

	Sample QC-1 (N=2)		Sample QC-2 (N=2)	
Target Compound	Conc., µg/L	%Recovery	Conc., µg/L	%Recovery
Chloroform	11.9	108	63.4	139
1,1,1-Trichloroethane	0.91	82	13.8	98
Trichloroethylene	2.79	107	13.5	104
Bromodichloromethane	2.20	130	10.7	124
Dibromochloromethane	2.37	99	11.2	93
Tetrachloroethylene	0.98	89	4.72	84
Bromoform	2.32	83	5.17	50

GENERAL QUALITY ASSURANCE ISSUES

Recovery of Deuterated Chemicals from Tenax Sampling Cartridges

Deuterated chemicals were spiked onto 10% of all Tenax GC sampling cartridges and then used in personal and fixed-site air sampling. Recovery of the deuterated chemicals were determined to assess apparent accuracy of sampling and analysis.

Table 89 provides an overall comparison of deuterated and non-deuterated (these cartridges were not used in sampling) benzene, chlorobenzene, and ethylbenzene recovered. Additional data are given in Appendix M. Quantitative recoveries and a good agreement between deuterated and non-deuterated chemical recoveries were observed.

Chemical Analysis Issues

Appendix N gives documentation on chemical analysis issues, while Appendix O gives Quality Assurance -- Corrective Actions that were taken during sample analysis.

Quality Assurance of Data Files

Appendix P presents QA of the data files prior to statistical analysis. Corrective action was taken where errors were found.

Analysis of Quality Assurance Data

Appendix Q gives papers containing information on the analysis of QA data.

TABLE 89. COMPARISON OF DEUTERATED AND NONDEUTERATED BENZENE, CHLOROBENZENE AND ETHYLBENZENE SPIKED ONTO TENAX CARTRIDGES[a]

Geographical Area	Benzene-d_6 Mean ± %RSD (N)	Benzene	Chlorobenzene-d_5 Mean ± %RSD (N)	Chlorobenzene	Ethylbenzene-d_{10} Mean ± %RSD (N)	Ethylbenzene (N)
Los Angeles, Winter	73 ± 26 (17)	115 ± 18 (18)	90 ± 20 (17)	85 ± 29 (12)	99 ± 17 (17)	93 ± 18 (10)
Los Angeles, Summer	82 ± 29 (36)	90 ± 8 (7)	89 ± 39 (36)	99 ± 15 (7)	92 ± 26 (36)	100 ± 26 (7)
Antioch/Pittsburg, Summer	91 ± 15 (19)	115 ± 9 (9)	101 ± 26 (19)	90 ± 16 (9)	100 ± 20 (19)	98 ± 13 (9)

[a] Deuterated chemicals were added to sampling cartridges prior to sampling, cartridges was used in field sampling for breath, personal air or fixed-site air sampling. Mean is percent recovered, with percent relative standard deviation (no of observations). Nondeuterated chemicals were added to control cartridges which were transported and stored but not used in field sampling.

SECTION 8

STATISTICAL ANALYSIS OF DATA

This section gives the statistical analysis for the two seasons (winter and spring) of data collected in Los Angeles and one season in Contra Costa (spring). Each season is analyzed separately followed by the analysis of data collected in Contra Costa. The two seasons of Los Angeles are then compared. In general, as described previously, data was collected on several volatile organics (VOLs) in air (personal and outdoor fixed-site), water and breath samples from a probability sample of individuals in the two areas.

LOS ANGELES FIRST SEASON

The analysis of the first season (February and March, 1984) of Los Angeles, California, consists in part of a study of the quantifiable limits, weighted percents measurable, weighted summary statistics, correlations, and unweighted personal versus outdoor air levels for the 117 individuals sampled.

A description of these 117 people studied in Los Angeles in the first season (February and March, 1984) is given by the results of the Household Questionnaire in Table 90. Slightly more than half (53%) were male. The age range was from 7 to 78 years. About 67% were employed, 6% were housewives, 15% were students, and 7% were retired. About 33% were current smokers while 17% were former smokers. The vast majority of smokers used cigarettes. Eleven people listed painting as a hobby while seven listed it as an occupation. Only eleven people used air conditioning to cool their homes, while 97 used gas furnaces to heat them.

To gain information on the activities of the participants during the twenty-four hour study period, a 24-hour screener was administered at the end of the period. The results of this screener are given in Table 91. More people were exposed to tobacco (31%) or smoking (38%), service stations or garages (19%), odorous chemicals (22%), auto or truck exhaust (18%), and cleaning solutions (18%) during the 24-hour period than any other substances covered by the screener.

NOTES TO TABLES

1. The terms daytime outdoor air and overnight outdoor air refer to samples collected during the day and during the night from fixed-sites outside the participants' homes.
2. Bromodichloromethane, dibromochloromethane, and bromoform were not analyzed in air samples. Only chloroform, 1,1,1-trichloroethane, trichloroethylene, bromodichloromethane, dibromochloromethane, tetrachloroethylene, chlorobenzene, and bromoform were analyzed in water samples.
3. Sample size indicates the number of individual samples. The minimum and maximum sample sizes indicate that not all compounds always had a value for every individual sampled.
4. Duplicate measurements were averaged before the percentages were computed.
5. Measurable is defined as above the quantifiable limit. All concentration data is considered significant to two figures.
6. Los Angeles, first season was February and March of 1984.
7. To calculate an estimate of the 95% confidence interval for the geometric mean, the upper limit would be (geo. mean) + 1.96 (geo. s.e.) while the upper limit would be (geo. mean) - 1.96 (geo. s.e.) where geo. mean is the geometric mean and geo. s.e. is the standard error of the geometric mean.

TABLE 90. HOUSEHOLD QUESTIONNAIRE - LOS ANGELES

1.	Sex	Male = 62, Female = 55
2.	Race - Hispanic	19
	- American Indian/Alaskan Native	0
	- Black, Not Hispanic	7
	- Asian/Pacific Islander	11
	- White, Not Hispanic	77
	- Other	2
		116
3.	Age - 7	1
	- 11-14	10
	- 15-19	12
	- 20-24	13
	- 25-29	19
	- 30-34	10
	- 35-39	14
	- 40-44	8
	- 45-49	6
	- 50-54	4
	- 55-59	7
	- 60-64	4
	- 65-69	4
	- 70-74	3
	- 75-78	2
		117
7.	Are you presently employed?	Yes = 78, No = 39
11.	If not presently employed, which of the following best describes your status?	
	Housewife	7
	Student	18
	Unemployed	3
	Retired	8
	Disabled	3
		39

continued

TABLE 90 (continued)

12. Indicate whether you or any member of your household are employed in any of the listed occupations or establishments.

	You	Household Member
Painting	7	5
Dry Cleaning		
Chemical Plant	2	1
Petroleum Plant		
Service Station/Garage/Engine Repair	1	3
Furniture Repair/Refinishing		1
Plastics Manufacture or Formulation	4	1
Textile Mill		
Wood Processing Plant	1	
Printing	2	1
Scientific Laboratory	4	3
Dye Plant		
Hospital	5	6
Metal Products	2	5
Battery or Electrical Component Manufacture	2	1
Refrigerator/Air Conditioning Repair or Manufacture	1	1
Taxi/Bus/Truck Driver	1	2
Pest Control	1	1
Drug Manufacturing or Formulation	1	2
Photo Developing	2	
Landscaping/Gardening	2	2
None of the Above	87	84

13. Cigarette Smoking Status

Current Smoker	39
Ex-Smoker	20
Never Smoked	58
	117

14. For How Many Years Did You Smoke At Least ½ Pack of Cigarettes Per Day?

2-5	6
10-13	4
15-18	3
20	2
26	1
32-35	3
	19

15. How Long Ago Did You Quit Smoking?

Less than 1 year	4
1-5 years	3
7-8 years	3
11-13 years	3
30 years	1
	14

continued

TABLE 90 (continued)

16 a. On Average, How Many Cigarettes Do/Did You Smoke Per Day?

Less than ½ Pack	14
Between ½ and 1½ Packs	33
More Than 1½ Packs	12
	59

17. Does Anyone Else In Your Household Smoke Cigarettes?
Yes = 39, No = 78

18. Do You or Anyone Else In Your Household Smoke Cigars Or Pipes?
You ..... Yes = 1 Anyone Else ..... Yes = 2
No = 84 No = 83

19. On Average, How Many Hours Are You In The Same Room, Or Enclosed Area, With Someone Who Is Smoking? Respond For Time At Home, And Time At Work.

At Home		At Work	
0	72	0	63
1-5	33	1-5	21
6-10	7	6-10	23
10+	5	10+	3
	117		110

20. Do You Or Any Member Of Your Household Pursue Any Of The Following Hobbies?

	You	Household Member
Painting	11	9
Furniture Refinishing	7	4
Scale Models	11	10
Gardening	29	37
None of These	77	61

21. Do You Work With Or Use Insecticides, Pesticides, or Herbicies, As In Farming, Gardening, Or Extermination?
Yes = 23, No = 94

a. How Often Would You Say That You Work With Or Use Such Substances?

Rarely	7
Occasionally	12
Often	3
	22

b. How Often Do You Have Your House Treated For Pests?

Never	59
Monthly	4
Quarterly	9
Yearly	37
	109

continued

TABLE 90 (continued)

22. What Do You Consider Your Current Physical Condition?

Excellent	42
Good	53
Fair	21
Poor	1
	117

23. Are You Currently Taking Any Prescription Medication On A Regular Daily Basis?

Yes = 26 No = 87

24. Have You Taken Any Nonprescription Medication In The Past 48 Hours?

Yes = 53 No = 62

29. How Many Years Have You Lived In This City?

0-4	35
5-9	22
10-14	23
15-19	12
20-24	6
25-28	6
30-34	6
42-43	4
58	1
	115

30. Do You Cool Your Home With Any Of The Following Appliances?

Central Air Conditioning	4
Window Air Conditioning	7
Portable Circulating Fan	43
Ceiling Exhaust Fan	20
None of These	49

31. Do You Have Any Of The Following Appliances?

Gas Stove	85
Electric Oven	62
Gas Furnace	97
Oil Heat	0

TABLE 91. 24-HOUR SCREENER - LOS ANGELES - FIRST SEASON

1. Have You Pumped Your Own Gas In The Past 24 Hours?
   Yes = 14, No = 102

   a. During Which Monitoring Periods?
      Overnight = 0, Daytime = 13

2. Have You Done Your Own Dry Cleaning or Been In A Dry Cleaning Establishment During The Past 24 Hours?
   Yes = 1, No = 116

   a. During Which Monitoring Periods?
      Overnight = 0, Daytime = 1

3. Have You Smoked Cigarettes, Cigars, Or A Pipe In The Past 24 Hours?
   Yes = 36, No = 81

   a. During Which Monitoring Periods?
      Overnight = 7, Daytime = 5, Both = 23

4. Were You In An Enclosed Area With Active Smokers For More Than 15 Minutes At Any Time In The Past 24 Hours?
   Yes = 45, No = 71

   a. During Which Monitoring Periods?
      Overnight = 12, Daytime = 19, Both = 14

5. Have You Used Or Worked With Insecticides, Pesticides, Or Herbicides In Any Way In The Past 24 Hours?
   Yes = 6, No = 109

6. During This Time Of Year, On An Average Weekday Or Weekend Day, How Many Hours Per Day Are Spent:

   a. Away From Home:

Weekday	0-4	17
	5-9	42
	10-14	53
	16-17	5
Weekend Day	0-4	34
	5-9	50
	10-14	24
	15-19	4
	20-24	5

continued

TABLE 91 (continued)

7. Have You Worked At Any Of The Following Occupations Or Been In Any Of The Following Businesses During The Past Week?

	Past Week	Past 24 Hours
Painting	15	14
Dry Cleaning	10	1
Chemical Plant	7	6
Petroleum Plant	2	2
Service Station/Garage/Engine Repair	62	22
Furniture Refinishing or Repair	6	1
Plastics Manufacture or Formulation	3	2
Textile Mill		
Wood Processing Plant	1	1
Printing	4	3
Scientific Laboratory	7	5
Dye Plant		
Hospital	12	6
Metal Work/Smelter	6	3
None of These	28	27

8. Have You Been Exposed To Any Of The Following During The Past Week?

	Past Week	Past 24 Hours
Solvents	31	15
Odorous Chemicals	60	26
Toxic or Hazardous Chemicals	12	6
High Dust or Particulate Levels	30	16
Auto/Truck Exhaust	41	21
Cleaning Solutions	42	15
Degreasing Compounds	15	5
Other	7	2

Table 92 presents a summary of the sample sizes available for the twenty-eight volatile compounds collected in environmental and breath samples for Los Angeles, first season. The table shows variation in sample sizes by media. This indicates that not all information was collected on each person. Also, as described earlier, the sample sizes for outdoor, fixed-sites were smaller than those of the other media.

CREATING THE COMPUTER ANALYSIS FILE

Before statistical analysis could be undertaken on the data collected for the 117 individuals, several manipulations were necessary to process the data collected and create computer analysis files. First, a few observations were deleted because it was deemed by RTI chemists that the data was questionable. Second, the water samples collected at two different time periods were averaged. Third, because of the difficulty of maintaining sufficient GC resolution for each pair of chemicals, the quantitative values of *m*-dichlorobenzene and *p*-dichlorobenzene as well as *m*-xylene and *p*-xylene were combined to give one number for *m,p*-dichlorobenzene and one for *m,p*-xylene. In this manner all samples could be more readily compared. Thus, analysis was done on 26 volatile compounds. Fourth, values below the level of detection (LOD) were set equal to 1/2 LOD and values at trace were set equal to 5/8 QL (quantifiable limit) where 5/8 QL was the midpoint between the LOD and the QL. For water there was no LOD category. Finally, duplicate samples were averaged. The max QL for a particular media and compound was then defined as the maximum of the individual quantifiable limits for each sample.

The calculated sampling weights described in Section 4 were adjusted to compensate for missing data. This adjustment was done by weight class per compound per media. The adjustment factors were calculated by obtaining the total weight for all observations within a weight class, then dividing by the total weight for all observations where concentration information was obtained and not missing. The original weight of the observation was then multiplied by the adjustment factor.

$$\text{adjusted weight} = \frac{\text{original weight x total weight per weight class}}{\text{total weight per weight class excluding those with missing data.}}$$

The population of inference was estimated to include 359,492 individuals in the Los Angeles area. Unless otherwise stated, all

TABLE 92. DATA AVAILABLE FOR STATISTICAL ANALYSIS BY MEDIA
LOS ANGELES FIRST SEASON

Media	Sample Size Range
Breath	112-115
Overnight Personal Air	110-114
Daytime Personal Air	110-114
Overnight Fixed-Site Outdoor Air	24-25
Daytime Fixed-Site Outdoor Air	23-25
Water	117

results apply to this population or a specified subgroup of this population.

QUANTIFIABLE LIMITS

Before presenting the percents measurable and summary statistics, the quantifiable limits for the various media and compounds were examined. The purpose of this examination was to indicate how these limits varied for each compound.

Tables 93 through 98 show by media and compound, minimum quantifiable limits (min QL), maximum quantifiable limits (max QL), ratios of max QL to min QL (R1), weighted percent above the max QL, weighted percent measurable (above the quantifiable limit), and ratios of percent measurable to percent above the max QL (R2). Overall, the range between the min QL and the max QL was small as demonstrated by the small values for R1. The largest ratios were for 1,4-dioxane in overnight personal air (4.28), a-pinene in daytime personal air (4.45), and in water trichloroethylene (6.00) and chlorobenzene (4.22). Because of little variation in the quantifiable limits, there appeared to be little difference in the percents measurable and the percents above the max QL as shown by the small values of R2. Some compounds which did show large ratios were for breath carbon tetrachloride (2.92) and n-dodecane (2.61), chlorobenzene (2.15) in overnight personal air, and tetrachloroethylene (3.92) in water.

WEIGHTED PERCENT MEASURABLE

The weighted percents of concentrations measurable (above the quantifiable limit) by compound for breath, overnight personal air, daytime personal air, overnight (fixed-site) outdoor air, daytime (fixed-site) outdoor air and water for Los Angeles, first season are shown in Table 99. For personal air and outdoor air, data was not analyzed for bromodichloromethane, dibromochloromethane, and bromoform. For water only chloroform, 1,1,1-trichloroethane, trichloroethylene, bromodichloromethane, dibromochloromethane, tetrachloroethylene, chlorobenzene, and bromoform were analyzed.

For breath and air 1,1,1-trichloroethane, benzene, tetrachloroethylene, o-xylene, and m,p-xylene were over 90% measurable. Carbon tetrachloride, styrene, ethylbenzene, n-octane, and n-undecane were over 90% measurable in personal and outdoor air but less so in breath.

TABLE 93. SUMMARY OF QUANTIFIABLE LIMITS AND PERCENTS MEASURABLE FOR BREATH SAMPLES (μg/m^3)
LOS ANGELES FIRST SEASON

Estimated Population Size: 359,492

	Minimum Quantifiable Limit	Maximum Quantifiable Limit	R1 Ratio Max. QL* / Min. QL**	% Above Maximum Quantifiable Limit	Percent Measurable	R2 Ratio % Measurable / % Above Max. QL
Chloroform	0.15	0.31	2.10	34.7	36.5	1.05
1,2-Dichloroethane	0.18	0.40	2.24	2.88	3.54	1.23
1,1,1-Trichloroethane	---	---	---	---	100.	---
Benzene	0.24	0.27	1.10	95.1	95.1	1.00
Carbon Tetrachloride	0.24	0.40	1.67	4.08	11.9	2.92
Trichloroethylene	0.16	0.40	2.53	39.6	50.0	1.26
Bromodichloromethane	0.17	0.40	2.37	0.38	0.38	1.00
Dibromochloromethane	0.24	0.40	1.65	0.00	0.00	---
Tetrachloroethylene	---	---	---	---	100.	---
Chlorobenzene	0.16	0.40	2.48	1.04	1.04	1.00
Bromoform	0.16	0.40	2.48	0.00	0.00	---
Styrene	0.16	0.31	1.94	45.2	47.1	1.04
m,p-Dichlorobenzene	0.24	0.31	1.29	75.1	78.7	1.05
o-Dichlorobenzene	0.18	0.40	2.24	9.23	13.3	1.44
Ethylbenzene	0.24	0.30	1.25	80.7	81.8	1.01
o-Xylene	0.24	0.27	1.13	89.8	91.0	1.01
m,p-Xylene	---	---	---	---	100.	---
n-Decane	0.15	0.40	2.72	46.0	52.9	1.15
n-Dodecane	0.24	0.40	1.67	11.6	30.3	2.61
1,4-Dioxane	0.24	0.52	2.17	5.18	7.52	1.45
1,1,1,2-Tetrachloroethane	0.24	0.40	1.65	0.00	0.00	---
1,2-Dibromoethane	0.24	0.40	1.65	0.00	0.00	---
n-Octane	0.24	0.27	1.13	78.6	80.9	1.03
n-Undecane	0.24	0.40	1.67	50.0	56.3	1.13
1,1,2,2-Tetrachloroethane	0.16	0.40	2.44	0.00	0.00	---
a-Pinene	0.24	0.40	1.67	85.5	91.5	1.07

* Max QL = Maximum Quantifiable Limit
** Min QL = Minimum Quantifiable Limit
--- 100% measurable

TABLE 94. SUMMARY OF QUANTIFIABLE LIMITS AND PERCENTS MEASURABLE FOR OVERNIGHT PERSONAL AIR SAMPLES (µg/m^3)
LOS ANGELES FIRST SEASON

Estimated Population Size: 359,492

	Minimum Quantifiable Limit	Maximum Quantifiable Limit	R1 Ratio Max. QL* / Min. QL**	% Above Maximum Quantifiable Limit	Percent Measurable	R2 Ratio % Measurable / % Above Max. QL
Chloroform	0.19	0.19	1.00	99.1	99.1	1.00
1,2-Dichloroethane	0.12	0.23	1.92	52.7	64.9	1.23
1,1,1-Trichloroethane	0.29	0.29	1.00	98.8	98.8	1.00
Benzene	---	---	---	---	100.	---
Carbon Tetrachloride	0.19	0.23	1.21	95.4	95.4	1.00
Trichloroethylene	0.18	0.22	1.24	88.1	91.1	1.03
Tetrachloroethylene	---	---	---	---	100.	---
Chlorobenzene	0.10	0.23	2.44	4.11	8.85	2.15
Styrene	0.20	0.23	1.15	95.0	95.0	1.00
m,p-Dichlorobenzene	0.18	0.21	1.16	97.3	97.3	1.00
o-Dichlorobenzene	0.10	0.26	2.74	24.7	30.4	1.23
Ethylbenzene	---	---	---	---	100.	---
o-Xylene	---	---	---	---	100.	---
m,p-Xylene	---	---	---	---	100.	---
n-Decane	0.16	0.22	1.41	88.5	89.6	1.01
n-Dodecane	0.19	0.25	1.32	92.1	95.8	1.04
1,4-Dioxane	0.11	0.48	4.28	35.3	54.6	1.55
1,1,1,2-Tetrachloroethane	0.16	0.48	3.08	0.00	2.29	---
1,2-Dibromoethane	0.11	0.23	2.13	3.06	3.88	1.27
n-Octane	0.20	0.20	1.00	98.8	98.8	1.00
n-Undecane	0.20	0.20	1.00	98.8	98.8	1.00
1,1,2,2-Tetrachloroethane	0.11	0.40	3.55	6.84	9.71	1.42
a-Pinene	0.20	0.74	3.70	92.5	97.9	1.06

* Max QL = Maximum Quantifiable Limit
** Min QL = Minimum Quantifiable Limit
--- 100% measurable

TABLE 95. SUMMARY OF QUANTIFIABLE LIMITS AND PERCENTS MEASURABLE FOR DAYTIME PERSONAL AIR SAMPLES ($\mu g/m^3$)
LOS ANGELES FIRST SEASON

Estimated Population Size: 359,492

	Minimum Quantifiable Limit	Maximum Quantifiable Limit	R1 Ratio Max. QL* / Min. QL**	% Above Maximum Quantifiable Limit	Percent Measurable	R2 Ratio % Measurable / % Above Max. QL
Chloroform	0.18	0.22	1.25	94.6	95.4	1.01
1,2-Dichloroethane	0.13	0.26	2.07	49.2	67.5	1.37
1,1,1-Trichloroethane	---	---	---	---	100.	---
Benzene	---	---	---	---	100.	---
Carbon Tetrachloride	0.22	0.22	1.02	97.9	97.9	1.00
Trichloroethylene	0.19	0.26	1.37	90.8	92.1	1.01
Tetrachloroethylene	---	---	---	---	100.	---
Chlorobenzene	0.12	0.25	2.17	7.78	12.5	1.61
Styrene	0.21	0.21	1.00	97.7	97.7	1.00
m,p-Dichlorobenzene	0.18	0.22	1.22	96.2	96.2	1.00
o-Dichlorobenzene	0.12	0.26	2.17	20.5	24.9	1.21
Ethylbenzene	---	---	---	---	100.	---
o-Xylene	0.20	0.20	1.00	98.8	98.8	1.00
m,p-Xylene	---	---	---	---	100.	---
n-Decane	0.18	0.22	1.20	96.0	96.0	1.00
n-Dodecane	0.19	0.22	1.16	94.8	94.8	1.00
1,4-Dioxane	0.16	0.44	2.68	33.0	48.0	1.45
1,1,1,2-Tetrachloroethane	0.16	0.48	2.93	2.95	3.38	1.15
1,2-Dibromoethane	0.12	0.24	2.01	3.71	4.11	1.11
n-Octane	0.16	0.19	1.17	98.4	98.4	1.00
n-Undecane	0.21	0.21	1.00	98.9	98.9	1.00
1,1,2,2-Tetrachloroethane	0.16	0.24	1.46	6.27	6.68	1.07
a-Pinene	0.20	0.89	4.45	77.4	88.4	1.14

* Max QL = Maximum Quantifiable Limit
** Min QL = Minimum Quantifiable Limit
--- 100% measurable

TABLE 96. SUMMARY OF QUANTIFIABLE LIMITS AND PERCENTS MEASURABLE FOR OVERNIGHT OUTDOOR AIR SAMPLES ($\mu g/m^3$) LOS ANGELES FIRST SEASON

Estimated Population Size: 359,492

	Minimum Quantifiable Limit	Maximum Quantifiable Limit	R1 Ratio Max. QL* / Min. QL**	% Above Maximum Quantifiable Limit	Percent Measurable	R2 Ratio % Measurable / % Above Max. QL
Chloroform	0.17	0.20	1.18	86.8	94.0	1.08
1,2-Dichloroethane	0.17	0.20	1.19	56.9	60.4	1.06
1,1,1-Trichloroethane	---	---	---	---	100.	---
Benzene	---	---	---	---	100.	---
Carbon Tetrachloride	0.20	0.20	1.00	92.9	96.8	1.04
Trichloroethylene	0.20	0.20	1.00	92.9	96.8	1.04
Tetrachloroethylene	0.18	0.18	1.00	97.4	97.4	1.00
Chlorobenzene	0.11	0.21	1.88	8.98	8.98	1.00
Styrene	---	---	---	---	100.	---
m,p-Dichlorobenzene	---	---	---	---	100.	---
o-Dichlorobenzene	0.13	0.21	1.56	56.5	58.6	1.04
Ethylbenzene	0.19	0.19	1.00	95.8	95.8	1.00
o-Xylene	---	---	---	---	100.	---
m,p-Xylene	---	---	---	---	100.	---
n-Decane	0.20	0.20	1.02	93.5	93.5	1.00
n-Dodecane	0.17	0.20	1.18	92.9	92.9	1.00
1,4-Dioxane	0.17	0.20	1.19	64.6	69.5	1.08
1,1,1,2-Tetrachloroethane	0.16	0.21	1.27	0.00	0.00	---
1,2-Dibromoethane	0.16	0.21	1.28	0.00	0.00	---
n-Octane	0.17	0.19	1.12	94.5	94.5	1.00
n-Undecane	0.20	0.20	1.00	96.9	96.9	1.00
1,1,2,2-Tetrachloroethane	0.11	0.21	1.86	0.00	0.00	---
a-Pinene	0.20	0.20	1.02	93.5	93.5	1.00

* Max QL = Maximum Quantifiable Limit

** Min QL = Minimum Quantifiable Limit

--- 100% measurable

TABLE 97. SUMMARY OF QUANTIFIABLE LIMITS AND PERCENTS MEASURABLE FOR DAYTIME OUTDOOR AIR SAMPLES ($\mu g/m^3$)
LOS ANGELES FIRST SEASON

Estimated Population Size: 359,492

	Minimum Quantifiable Limit	Maximum Quantifiable Limit	R1 Ratio Max. QL* / Min. QL**	% Above Maximum Quantifiable Limit	Percent Measurable	R2 Ratio % Measurable / % Above Max. QL
Chloroform	0.20	0.22	1.12	69.1	77.9	1.13
1,2-Dichloroethane	0.19	0.23	1.21	8.73	15.7	1.80
1,1,1-Trichloroethane	---	---	---	---	100.	---
Benzene	---	---	---	---	100.	---
Carbon Tetrachloride	---	---	---	---	100.	---
Trichloroethylene	0.19	0.20	1.05	84.3	87.5	1.04
Tetrachloroethylene	---	---	---	---	100.	---
Chlorobenzene	0.12	0.23	1.91	9.58	9.58	1.00
Styrene	0.20	0.22	1.10	92.5	92.5	1.00
m,p-Dichlorobenzene	0.19	0.22	1.16	83.1	88.7	1.07
o-Dichlorobenzene	0.19	0.23	1.21	21.8	32.0	1.47
Ethylbenzene	---	---	---	---	100.	---
o-Xylene	---	---	---	---	100.	---
m,p-Xylene	---	---	---	---	100.	---
n-Decane	0.19	0.19	1.00	95.8	95.8	1.00
n-Dodecane	0.19	0.22	1.16	73.6	79.3	1.08
1,4-Dioxane	0.19	0.23	1.22	22.4	27.6	1.23
1,1,1,2-Tetrachloroethane	0.19	0.23	1.21	0.00	0.00	---
1,2-Dibromoethane	0.19	0.23	1.21	0.00	0.00	---
n-Octane	0.22	0.22	1.00	96.7	96.7	1.00
n-Undecane	0.20	0.20	1.00	95.8	95.8	1.00
1,1,2,2-Tetrachloroethane	0.19	0.23	1.21	0.00	0.00	---
a-Pinene	0.19	0.22	1.16	54.1	61.6	1.14

* Max QL = Maximum Quantifiable Limit
** Min QL = Minimum Quantifiable Limit
--- 100% measurable

TABLE 98. SUMMARY OF QUANTIFIABLE LIMITS AND PERCENTS MEASURABLE FOR WATER SAMPLES (ng/mL)
LOS ANGELES FIRST SEASON

Estimated Population Size: 359,492

	Minimum Quantifiable Limit	Maximum Quantifiable Limit	R1 Ratio Max. QL* Min. QL**	% Above Maximum Quantifiable Limit	Percent Measurable	R2 Ratio % Measurable % Above Max. QL
Chloroform	1.50	1.50	1.00	80.5	93.6	1.16
1,1,1-Trichloroethane	0.05	0.10	2.00	41.6	47.9	1.15
Trichloroethylene	0.05	0.30	6.00	0.00	7.80	---
Bromodichloromethane	0.30	0.32	1.07	93.3	93.3	1.00
Dibromochloromethane	0.21	0.38	1.81	86.8	88.7	1.02
Tetrachloroethylene	0.05	0.15	3.00	5.74	22.5	3.92
Chlorobenzene	0.09	0.38	4.22	0.00	12.8	---
Bromoform	0.24	0.55	2.29	48.6	69.0	1.42

* Max QL = Maximum Quantifiable Limit
** Min QL = Minimum Quantifiable Limit

TABLE 99. WEIGHTED PERCENT MEASURABLE BY MEDIA - LOS ANGELES FIRST SEASON

Population Estimate: 359,492

	Breath	Overnight Personal Air	Daytime Personal Air	Overnight Outdoor Air	Daytime Outdoor Air	Water
Chloroform	36.5	99.1	95.4	94.0	77.9	93.6
1,2-Dichloroethane	3.54	64.9	67.5	60.4	15.7	---
1,1,1-Trichloroethane	100.	98.8	100.	100.	100.	47.9
Benzene	95.1	100.	100.	100.	100.	---
Carbon Tetrachloride	11.9	95.4	97.9	96.8	100.	---
Trichloroethylene	50.0	91.1	92.1	96.8	87.5	7.80
Bromodichloromethane	0.38	---	---	---	---	93.3
Dibromochloromethane	0.00	---	---	---	---	88.7
Tetrachloroethylene	100.	100.	100.	97.4	100.	22.5
Chlorobenzene	1.04	8.85	12.5	8.98	9.58	12.8
Bromoform	0.00	---	---	---	---	69.0
Styrene	47.1	95.0	97.7	100.	92.5	---
m,p-Dichlorobenzene	78.7	97.3	96.2	100.	88.7	---
o-Dichlorobenzene	13.3	30.4	24.9	58.6	32.0	---
Ethylbenzene	81.8	100.	100.	95.8	100.	---
o-Xylene	91.0	100.	98.8	100.	100.	---
m,p-Xylene	100.	100.	100.	100.	100.	---
n-Decane	52.9	89.6	96.0	93.5	95.8	---
n-Dodecane	30.3	95.8	94.8	92.9	79.3	---
1,4-Dioxane	7.52	54.6	48.0	69.5	27.6	---
1,1,1,2-Tetrachloroethane	0.00	2.29	3.38	0.00	0.00	---
1,2-Dibromoethane	0.00	3.88	4.11	0.00	0.00	---
n-Octane	80.9	98.8	98.4	94.5	96.7	---
n-Undecane	56.3	98.8	98.9	96.9	95.8	---
1,1,2,2-Tetrachloroethane	0.00	9.71	6.68	0.00	0.00	---
a-Pinene	91.5	97.9	88.4	93.5	61.6	---
Sample Size Range:	112-115	111-114	110-114	24-25	23-25	117

--- Not analyzed in this media.

Chlorobenzene, 1,1,1,2-tetrachlorcethane, 1,2-dibromoethane, and 1,1,2,2-tetrachloroethane were less than 15% measurable for breath and the airs. For water chloroform, bromodichloromethane, and dibromochloromethane showed percents measurable of greater than 85% while trichloroethylene and chlorobenzene were less than 15% measurable.

Generally, the percentages seemed about the same for overnight and daytime personal air and outdoor air with some compounds such as 1,2-dichloroethane and a-pinene lower in daytime outdoor air. There was also a tendency in some compounds for the percent measurable of breath samples to appear lower than the percentages for air.

WEIGHTED SUMMARY STATISTICS

Additional analyses were done on those compounds with at least 15% measurable in one of the media. In particular, weighted summary statistics were computed for nineteen compounds for breath, personal airs, and outdoor airs and for seven compounds for water.

Tables 100 through 105 give median quantifiable limits, arithmetic means, arithmetic standard errors, geometric means, geometric standard errors, percentiles, and ranges for the selected compounds by media. The reader should view the estimated weighted 99th percentiles with caution since it is essentially estimated by the maximum values of each of the various distributions.

In comparing the measures of central tendency, the arithmetic mean appeared almost always higher than the median and the geometric mean. The difference in these statistics seemed sometimes quite large as for 1,1,1-trichloroethane for breath and daytime personal air. One explanation for this can be illustrated by comparing the 90th percentile to the maximum concentration shown in the range. In the cases cited above, the maximum value appeared more than twenty times larger than the 90th percentile. This suggest large outliers which were increasing the arithmetic mean. Generally, for air and breath samples, daytime personal air concentrations seemed largest followed by overnight personal air. However, for breath and outdoor air the distinctions seemed less clear. While there appeared to be some tendency for the means to be higher for outdoor air, the maximum values for breath tended to be higher. One possible explanation for this may be seen by again comparing the 90th percentiles to the maximum values. There appeared to

TABLE 100. WEIGHTED SUMMARY STATISTICS FOR SELECTED COMPOUNDS FOR BREATH ($\mu g/m^3$) - LOS ANGELES FIRST SEASON

Estimated Population: 359,492
Sample Size Range: 112-115

	a/ Mid. Q.L.	Arith. Mean	b/ Arith. S.E.	c/ Geo. Mean	d/ Geo. S.E.	Percentiles								Range
						16	25	Med.	75	84	90	95	99	
Chloroform	0.27	0.64	0.13	0.15	0.02	0.03	0.03	0.10	0.70	1.20	1.70	2.60	3.70	0.03 - 18.0
1,2-Dichloroethane	0.27	0.13	0.08	0.04	0.00	0.03	0.03	0.03	0.03	0.03	0.04	0.17	7.50	0.03 - 7.50
1,1,1-Trichloroethane	e/	39.1	14.4	8.38	1.03	2.80	3.40	6.30	12.0	27.0	58.0	130.	530.	1.20 - 1500
Benzene	0.27	8.04	0.88	3.45	0.59	1.10	1.70	3.10	12.0	17.0	23.0	26.0	55.0	0.03 - 56.0
Carbon Tetrachloride	0.27	0.21	0.02	0.18	0.01	0.16	0.17	0.17	0.17	0.19	0.30	0.38	0.92	0.03 - 2.35
Trichloroethylene	0.27	1.63	0.70	0.29	0.05	0.03	0.04	0.19	1.00	1.80	2.50	5.00	12.0	0.03 - 180.
Tetrachloroethylene	e/	12.0	2.39	6.96	0.59	3.60	4.00	5.80	10.0	15.0	25.0	37.0	160.	1.60 - 170.
Styrene	0.27	0.94	0.17	0.20	0.03	0.03	0.03	0.17	1.21	1.83	2.62	4.60	7.30	0.03 - 7.70
m,p-Dichlorobenzene	0.27	5.03	1.09	0.99	0.20	0.17	0.31	0.54	3.00	6.90	20.0	35.0	62.0	0.03 - 62.0
o-Dichlorobenzene	0.27	0.14	0.03	0.06	0.01	0.03	0.03	0.03	0.05	0.17	0.30	0.60	1.60	0.03 - 1.70
Ethylbenzene	0.27	1.51	0.18	0.75	0.08	0.17	0.37	0.80	1.60	3.10	3.50	5.70	9.80	0.03 - 22.0
o-Xylene	0.27	1.01	0.09	0.73	0.07	0.30	0.40	0.74	1.30	1.75	2.00	2.50	4.10	0.15 - 10.4
m,p-Xylene	e/	3.51	0.34	2.32	0.22	0.91	1.19	2.30	3.90	6.10	7.30	9.70	22.0	0.35 - 39.0
n-Decane	0.27	0.83	0.20	0.27	0.04	0.03	0.09	0.32	0.66	1.10	1.80	3.40	15.0	0.03 - 15.0
n-Dodecane	0.27	0.24	0.02	0.19	0.01	0.17	0.17	0.17	0.29	0.36	0.41	0.51	1.20	0.03 - 1.50
1,4-Dioxane	0.27	0.15	0.05	0.05	0.01	0.03	0.03	0.03	0.03	0.05	0.17	0.67	2.60	0.03 - 2.60
n-Octane	0.27	0.96	0.19	0.47	0.08	0.17	0.28	0.50	0.85	1.30	1.60	2.70	11.0	0.03 - 16.0
n-Undecane	0.27	0.60	0.10	0.28	0.04	0.03	0.17	0.40	0.78	1.00	1.30	1.70	7.30	0.03 - 7.30
a-Pinene	0.27	1.52	0.19	0.94	0.10	0.41	0.57	0.90	1.50	2.00	3.50	5.40	10.0	0.03 - 10.0

a/ Mid. Q.L. = Median Quantifiable Limit
b/ Arith. S.E. = Standard Error of Arithmetic Mean
c/ Geo. Mean = Geometric Mean
d/ Geo. S.E. = Standard Error of Geometric Mean
e/ 100% measurable

TABLE 101. WEIGHTED SUMMARY STATISTICS FOR SELECTED COMPOUNDS FOR OVERNIGHT PERSONAL AIR (µg/m^3) - LOS ANGELES FIRST SEASON

Estimated Population: 359,492
Sample Size Range: 111-114

	a/ Mid. Q.L.	Arith. Mean	b/ Arith. S.E.	c/ Geo. Mean	d/ Geo. S.E.	Percentiles 16	25	Med.	75	84	90	95	99	Range
Chloroform	0.19	2.17	0.19	1.51	0.15	0.68	0.83	1.50	2.90	4.40	5.00	6.00	7.20	0.12 - 9.70
1,2-Dichloroethane	0.19	0.69	0.38	0.22	0.03	0.12	0.13	0.25	0.42	0.52	0.67	1.10	1.40	0.02 - 51.0
1,1,1-Trichloroethane	0.29	40.5	5.58	26.6	4.84	15.0	19.0	26.0	50.0	63.0	84.0	130.	200.	0.04 - 240.
Benzene	e/	16.5	1.30	13.6	1.35	8.40	11.0	15.0	21.0	25.0	30.0	34.0	41.0	0.73 - 43.0
Carbon Tetrachloride	0.22	0.73	0.05	0.65	0.05	0.46	0.52	0.65	0.87	0.99	1.10	1.50	2.30	0.12 - 2.60
Trichloroethylene	0.20	3.97	0.77	1.17	0.24	0.31	0.43	1.10	3.45	5.90	6.90	14.0	66.0	0.02 - 66.0
Tetrachloroethylene	e/	13.5	1.64	8.91	0.80	5.30	6.00	8.30	14.0	18.0	22.0	56.0	130.	0.81 - 130.
Styrene	0.21	3.40	0.21	2.37	0.30	1.30	1.90	2.80	4.70	5.95	6.70	8.30	9.20	0.03 - 9.20
m,p-Dichlorobenzene	0.20	20.2	5.39	3.48	0.69	0.88	1.25	2.60	7.30	15.0	54.0	100.	430.	0.03 - 430.
o-Dichlorobenzene	0.20	0.27	0.05	0.09	0.01	0.02	0.03	0.11	0.25	0.40	0.66	1.20	3.30	0.02 - 3.30
Ethylbenzene	e/	8.69	0.78	7.01	0.74	3.80	4.90	7.90	11.0	13.0	16.0	19.0	22.8	1.00 - 29.0
o-Xylene	e/	10.7	0.83	8.95	0.86	5.50	7.00	9.70	14.0	16.0	19.0	20.5	25.0	1.20 - 34.0
m,p-Xylene	e/	23.4	1.60	20.3	1.62	13.0	16.0	22.0	31.0	35.0	40.0	42.0	51.0	4.10 - 58.0
n-Decane	0.18	2.58	0.29	1.32	0.24	0.45	0.93	2.00	3.70	5.00	5.90	7.60	12.0	0.02 - 12.0
n-Dodecane	0.20	2.02	0.22	1.28	0.15	0.66	0.75	1.30	2.30	3.50	4.40	6.45	12.0	0.03 - 12.0
1,4-Dioxane	0.37	0.53	0.11	0.22	0.04	0.05	0.05	0.24	0.59	0.78	1.40	2.30	3.60	0.02 - 4.20
n-Octane	0.20	4.61	0.40	3.40	0.42	1.80	2.40	3.70	6.00	7.00	8.40	10.0	15.0	0.03 - 38.0
n-Undecane	0.20	3.49	0.39	2.38	0.30	1.20	1.70	2.30	3.50	6.10	7.10	11.0	16.0	0.13 - 22.0
a-Pinene	0.20	5.17	0.57	3.17	0.38	1.50	2.10	3.40	5.20	7.50	12.0	16.0	30.0	0.03 - 44.0

a/ Mid. Q.L. = Median Quantifiable Limit
b/ Arith. S.E. = Standard Error of Arithmetic Mean
c/ Geo. Mean = Geometric Mean
d/ Geo. S.E. = Standard Error of Geometric Mean
e/ 100% measurable

TABLE 102. WEIGHTED SUMMARY STATISTICS FOR SELECTED COMPOUNDS FOR DAYTIME PERSONAL AIR ($\mu g/m^3$) - LOS ANGELES FIRST SEASON

Estimated Population: 339,492
Sample Size Range: 110-114

	a/ Mid. Q.L.	Arith. Mean	b/ Arith. S.E.	c/ Geo. Mean	d/ Geo. S.E.	Percentiles								Range
						16	25	Med.	75	84	90	95	99	
Chloroform	0.21	1.65	0.34	0.93	0.07	0.42	0.55	1.00	1.70	2.10	2.80	3.60	6.00	0.02 - 92.0
1,2-Dichloroethane	0.21	0.36	0.05	0.24	0.02	0.13	0.14	0.25	0.44	0.52	0.69	0.98	2.60	0.03 - 3.60
1,1,1-Trichloroethane	e/	153.	54.5	34.6	5.38	11.0	16.5	29.0	60.0	100.	170.	360.	3990	1.70 - 3990
Benzene	e/	19.1	1.53	15.1	1.00	8.50	9.60	15.0	23.0	28.0	35.0	51.0	86.0	2.80 - 86.0
Carbon Tetrachloride	0.22	1.28	0.30	0.77	0.07	0.50	0.56	0.69	0.87	0.96	1.30	4.10	19.0	0.03 - 19.0
Trichloroethylene	0.21	11.6	1.74	2.48	0.46	0.37	0.67	2.20	10.0	18.0	37.0	76.0	85.0	0.03 - 100.
Tetrachloroethylene	e/	17.5	2.63	9.66	0.89	4.20	5.20	8.20	16.1	19.0	35.0	59.0	200.	1.00 - 200.
Styrene	0.21	3.78	0.42	2.49	0.29	1.20	1.60	2.30	4.00	6.35	7.70	14.0	19.0	0.13 - 21.0
m,p-Dichlorobenzene	0.20	16.1	3.48	3.11	0.57	0.63	0.98	2.20	8.00	16.0	39.0	112.	250.	0.02 - 250.
o-Dichlorobenzene	0.21	0.54	0.17	0.08	0.01	0.02	0.03	0.03	0.16	0.45	0.79	2.60	13.0	0.02 - 13.0
Ethylbenzene	e/	13.7	1.66	8.73	0.85	4.00	4.80	8.00	14.0	21.0	33.0	42.0	110.	1.30 - 132.
o-Xylene	0.20	15.1	1.50	10.3	1.20	5.70	6.80	10.0	16.0	20.0	34.0	46.0	83.0	0.03 - 83.0
m,p-Xylene	e/	32.5	2.87	24.6	1.84	13.0	16.0	23.0	37.0	49.0	71.0	78.0	180.	4.50 - 220.
n-Decane	0.20	8.99	2.47	2.56	0.45	0.98	1.20	2.20	5.10	7.70	13.0	49.0	140.	0.02 - 140.
n-Dodecane	0.21	2.95	0.43	1.68	0.18	0.70	0.92	1.60	3.00	4.25	6.30	11.0	27.0	0.12 - 27.0
1,4-Dioxane	0.36	16.6	8.96	0.26	0.06	0.05	0.05	0.14	0.87	1.30	3.20	12.0	710.	0.02 - 710.
n-Octane	0.19	6.92	1.09	4.12	0.45	2.20	2.80	4.10	6.20	8.15	17.0	19.0	29.0	0.02 - 180.
n-Undecane	0.21	6.97	1.47	3.06	0.35	1.10	1.50	2.80	5.20	8.00	13.0	29.0	103.	0.13 - 103.
a-Pinene	0.83	3.12	0.21	1.84	0.19	0.54	0.94	1.90	3.90	6.10	7.20	9.30	18.0	0.10 - 21.0

a/ Mid. Q.L. = Median Quantifiable Limit
b/ Arith. S.E. = Standard Error of Arithmetic Mean
c/ Geo. Mean = Geometric Mean
d/ Geo. S.E. = Standard Error of Geometric Mean
e/ 100% measurable

TABLE 103. WEIGHTED SUMMARY STATISTICS FOR SELECTED COMPOUNDS FOR OVERNIGHT OUTDOOR AIR ($\mu g/m^3$) - LOS ANGELES FIRST SEASON

Estimated Population: 359,492
Sample Size Range: 24-25

	a/ Mid. Q.L.	Arith. Mean	b/ Arith. S.E.	c/ Geo. Mean	d/ Geo. S.E.	Percentiles 16	25	Med.	75	84	90	95	Range
Chloroform	0.20	1.14	0.38	0.65	0.16	0.23	0.39	0.62	1.50	1.60	1.90	5.90	0.03 - 5.90
1,2-Dichloroethane	0.19	0.27	0.07	0.15	0.04	0.02	0.03	0.23	0.35	0.40	0.51	1.30	0.02 - 1.30
1,1,1-Trichloroethane	e/	43.6	10.3	27.5	5.79	10.0	17.5	29.0	60.0	67.0	67.0	190.	1.70 - 190.
Benzene	e/	18.9	1.86	16.5	1.90	9.25	11.0	19.0	25.0	32.0	32.0	33.0	3.20 - 33.0
Carbon Tetrachloride	0.20	0.72	0.06	0.63	0.07	0.37	0.55	0.65	0.91	1.20	1.20	1.40	0.13 - 1.50
Trichloroethylene	0.20	0.95	0.16	0.72	0.13	0.29	0.40	0.72	1.30	1.70	2.00	2.30	0.13 - 3.00
Tetrachloroethylene	0.18	11.2	2.00	6.98	1.77	2.00	4.70	7.35	16.0	23.0	24.0	28.0	0.02 - 34.0
Styrene	e/	4.35	0.61	3.30	0.62	1.50	1.69	4.20	6.30	6.40	8.30	9.30	0.33 - 9.30
m,p-Dichlorobenzene	e/	2.84	0.68	1.90	0.37	0.83	1.50	1.70	3.50	4.10	5.90	8.00	0.28 - 21.0
o-Dichlorobenzene	0.19	0.23	0.03	0.19	0.03	0.10	0.12	0.21	0.30	0.42	0.43	0.50	0.03 - 0.55
Ethylbenzene	0.19	11.7	1.45	8.08	2.36	6.80	7.80	11.0	15.0	18.0	20.0	26.0	0.02 - 26.0
o-Xylene	e/	12.9	1.49	10.8	1.49	6.85	8.20	13.0	14.6	21.0	22.0	28.0	1.50 - 28.0
m,p-Xylene	e/	28.7	2.56	25.5	2.86	17.0	23.0	30.0	32.5	43.0	32.0	52.0	4.50 - 52.0
n-Decane	0.20	3.97	1.25	2.16	0.61	1.20	1.30	2.60	4.90	5.50	5.90	5.90	0.02 - 27.0
n-Dodecane	0.17	0.91	0.18	0.68	0.13	0.35	0.40	0.76	1.10	1.30	1.60	1.60	0.11 - 3.70
1,4-Dioxane	0.19	0.60	0.26	0.24	0.07	0.03	0.12	0.26	0.47	0.80	1.40	4.60	0.02 - 4.60
n-Octane	0.19	4.63	0.78	3.11	0.65	1.20	2.10	4.30	6.60	9.80	9.80	12.0	0.11 - 12.0
n-Undecane	0.20	2.97	0.86	1.81	0.40	0.53	1.06	2.25	3.60	3.80	4.90	4.90	0.13 - 19.0
a-Pinene	0.20	1.37	0.29	0.90	0.19	0.55	0.56	0.83	1.80	2.30	2.90	4.40	0.02 - 4.80

a/ Mid. Q.L. = Median Quantifiable Limit
b/ Arith. S.E. = Standard Error of Arithmetic Mean
c/ Geo. Mean = Geometric Mean
d/ Geo. S.E. = Standard Error of Geometric Mean
e/ 100% measurable

TABLE 104. WEIGHTED SUMMARY STATISTICS FOR SELECTED COMPOUNDS FOR DAYTIME OUTDOOR AIR ($\mu g/m^3$) - LOS ANGELES FIRST SEASON

Estimated Population: 359,492
Sample Size Range: 23-25

	a/ Mid. Q.L.	Arith. Mean	b/ Arith. S.E.	c/ Geo. Mean	d/ Geo. S.E.	Percentiles 16	25	Med.	75	84	90	95	Range
Chloroform	0.20	0.34	0.05	0.27	0.04	0.14	0.21	0.28	0.40	0.44	0.53	1.00	0.02 - 1.50
1,2-Dichloroethane	0.20	0.11	0.01	0.08	0.01	0.03	0.03	0.13	0.14	0.14	0.22	0.26	0.02 - 0.37
1,1,1-Trichloroethane	e/	23.6	3.57	16.9	3.17	6.60	7.05	20.0	37.5	43.0	46.0	46.5	2.60 - 78.0
Benzene	e/	13.2	1.34	11.2	1.50	5.70	8.10	14.0	18.0	19.0	21.0	22.0	1.90 - 35.0
Carbon Tetrachloride	e/	0.57	0.03	0.55	0.03	0.49	0.50	0.56	0.63	0.67	0.69	0.69	0.20 - 1.30
Trichloroethylene	0.19	0.61	0.10	0.45	0.08	0.20	0.26	0.46	0.77	0.94	1.40	1.50	0.12 - 2.90
Tetrachloroethylene	e/	9.83	1.58	6.75	1.37	2.20	3.20	9.00	16.0	18.0	20.0	21.0	1.30 - 39.0
Styrene	0.20	3.31	0.81	1.47	0.50	0.30	0.67	1.90	4.20	6.20	9.00	14.0	0.02 - 14.0
m,p-Dichlorobenzene	0.22	1.49	0.41	0.73	0.23	0.22	0.35	0.97	1.55	2.10	4.40	7.50	0.03 - 9.60
o-Dichlorobenzene	0.20	0.23	0.05	0.17	0.03	0.12	0.13	0.14	0.22	0.50	0.50	0.86	0.02 - 0.86
Ethylbenzene	e/	7.68	1.04	6.07	0.93	3.00	4.40	7.10	11.0	11.0	12.0	22.0	0.82 - 28.0
o-Xylene	e/	8.56	1.20	6.77	1.02	3.50	4.20	7.90	11.0	11.0	13.0	24.0	1.00 - 34.0
m,p-Xylene	e/	20.3	2.26	17.1	2.24	10.0	12.4	21.0	25.0	28.0	31.0	49.0	2.80 - 61.0
n-Decane	0.19	1.90	0.37	1.24	0.29	0.29	0.81	1.10	2.60	3.10	4.90	5.90	0.12 - 5.90
n-Dodecane	0.20	0.54	0.09	0.41	0.07	0.13	0.21	0.48	0.76	0.83	0.85	1.30	0.12 - 1.70
1,4-Dioxane	0.20	0.22	0.07	0.11	0.03	0.03	0.03	0.13	0.14	0.33	0.37	0.87	0.02 - 1.60
n-Octane	0.22	3.16	0.65	1.79	0.44	0.79	1.00	1.90	4.50	5.50	5.65	11.0	0.03 - 18.0
n-Undecane	0.20	1.42	0.24	0.95	0.23	0.28	0.59	1.20	2.25	2.80	2.80	3.00	0.02 - 4.40
a-Pinene	0.20	0.29	0.03	0.23	0.02	0.13	0.13	0.25	0.33	0.58	0.60	0.74	0.03 - 1.10

a/ Mid. Q.L. = Median Quantifiable Limit
b/ Arith. S.E. = Standard Error of Arithmetic Mean
c/ Geo. Mean = Geometric Mean
d/ Geo. S.E. = Standard Error of Geometric Mean
e/ 100% measurable

TABLE 105. WEIGHTED SUMMARY STATISTICS FOR SELECTED COMPOUNDS FOR WATER (ng/mL) - LOS ANGELES FIRST SEASON

Estimated Population: 359,492
Sample Size Range: 117

	a/ Mid. Q.L.	Arith. Mean	b/ Arith. S.E.	c/ Geo. Mean	d/ Geo. S.E.	Percentiles 16	25	Med.	75	84	90	95	99	Range
Chloroform	1.50	14.3	1.41	8.04	1.66	1.00	5.55	14.5	20.0	22.2	28.0	32.0	37.4	0.03 - 59.6
1,1,1-Trichloroethane	0.08	0.15	0.04	0.09	0.01	0.05	0.05	0.06	0.15	0.19	0.28	0.44	0.55	0.03 - 4.18
Trichloroethylene	0.07	0.08	0.01	0.06	0.01	0.03	0.04	0.04	0.11	0.19	0.19	0.19	0.24	0.03 - 0.24
Bromodichloromethane	0.30	10.7	0.84	6.74	1.21	0.72	5.09	12.5	15.6	16.3	17.3	19.6	21.4	0.19 - 22.8
Dibromochloromethane	0.25	9.38	0.91	4.91	1.05	0.49	2.41	10.6	14.8	16.3	17.1	18.4	18.8	0.13 - 19.3
Tetrachloroethylene	0.05	0.07	0.01	0.05	0.00	0.03	0.03	0.03	0.09	0.09	0.11	0.15	0.55	0.03 - 0.55
Bromoform	0.55	0.78	0.14	0.56	0.05	0.34	0.34	0.54	0.92	1.08	1.18	1.50	11.6	0.15 - 11.6

a/ Mid. Q.L. = Median Quantifiable Limit
b/ Arith. S.E. = Standard Error of Arithmetic Mean
c/ Geo. Mean = Geometric Mean
d/ Geo. S.E. = Standard Error of Geometric Mean

be larger differences between the two for breath than for outdoor air. The medians for breath, daytime personal air, and daytime outdoor air are compared in Table 106. With the exception of o-dichlorobenzene, the medians for daytime personal air appeared about the same or larger than those for daytime outdoor air. However, with the exception of a-pinene, the medians for daytime outdoor air appeared larger than those for breath.

For breath, personal airs, and outdoor airs, 1,1,1-trichloroethane showed the largest overall values. Other compounds showing high relative values were benzene, tetrachloroethylene, m,p-dichlorobenzene and m,p-xylene for breath, overnight personal air, and daytime personal air. Also, for daytime personal air trichloroethylene, ethylbenzene, o-xylene, and 1,4-dioxane showed relatively large values. For overnight outdoor air benzene, tetrachloroethylene, ethylbenzene, and the xylenes appeared relatively higher, while for daytime outdoor air benzene and m,p-xylene appeared so.

For water chloroform, bromodichloromethane, and dibromochloromethane seemed to have relatively higher concentrations.

Figures 10 through 14 show box plots of chloroform, trichloroethylene, m,p-dichlorobenzene, o-xylene and n-undecane for breath and air. The plots demonstrate the trend of personal air levels being higher than breath and outdoor air levels; also, the skewness of some of the distributions.

Tables 107 and 108 compare the concentration levels of the selected compounds to the median quantifiable limits by media. Overall, the compound concentrations for breath and air seemed higher than the quantifiable limits. Exceptions were o-dichlorobenzene and 1,4-dioxane. Also, some compounds such as chloroform, carbon tetrachloride, trichloroethylene, styrene, and n-dodecane appeared high for air but low for breath. For water chloroform, bromodichloromethane, and dibromochloromethane appeared high while 1,1,1-trichloroethane, trichloroethylene, tetrachloroethylene and bromoform appeared low.

CORRELATIONS

To further study the relationships between media, unweighted Spearman correlations were computed for the selected compounds. Table 109 gives the correlations between breath and air for all amounts.

TABLE 106. MEDIANS AND THEIR RATIOS COMPARING DAYTIME PERSONAL AIR TO DAYTIME OUTDOOR AIR AND DAYTIME OUTDOOR AIR TO BREATH - LOS ANGELES FIRST SEASON

	Medians			Ratios	
Compound	Breath	Daytime Personal Air	Daytime Outdoor Air	Personal to Outdoor	Outdoor to Breath
Chloroform	0.10	1.00	0.28	3.57	2.80
1,2-Dichloroethane	0.03	0.25	0.13	1.92	4.33
1,1,1-Trichloroethane	6.30	29.0	20.0	1.45	3.17
Benzene	3.10	15.0	14.0	1.07	4.52
Carbon Tetrachloride	0.17	0.69	0.56	1.23	3.29
Trichloroethylene	0.19	2.20	0.46	4.78	2.42
Tetrachloroethylene	5.80	8.20	9.00	0.91	1.55
Styrene	0.17	2.30	1.90	1.21	11.2
m,p-Dichlorobenzene	0.54	2.20	0.97	2.27	1.80
o-Dichlorobenzene	0.03	0.03	0.14	0.21	4.67
Ethylbenzene	0.80	8.00	7.10	1.13	8.88
o-Xylene	0.74	10.0	7.90	1.27	10.7
m,p-Xylene	2.30	23.0	21.0	1.10	9.13
n-Decane	0.32	2.70	1.10	2.00	3.44
n-Dodecane	0.17	1.60	0.48	3.33	2.82
1,4-Dioxane	0.03	0.14	0.13	1.08	4.33
n-Octane	0.50	4.10	1.90	2.16	3.80
n-Undecane	0.40	2.80	1.20	2.33	3.00
a-Pinene	0.90	1.90	0.25	7.60	0.28

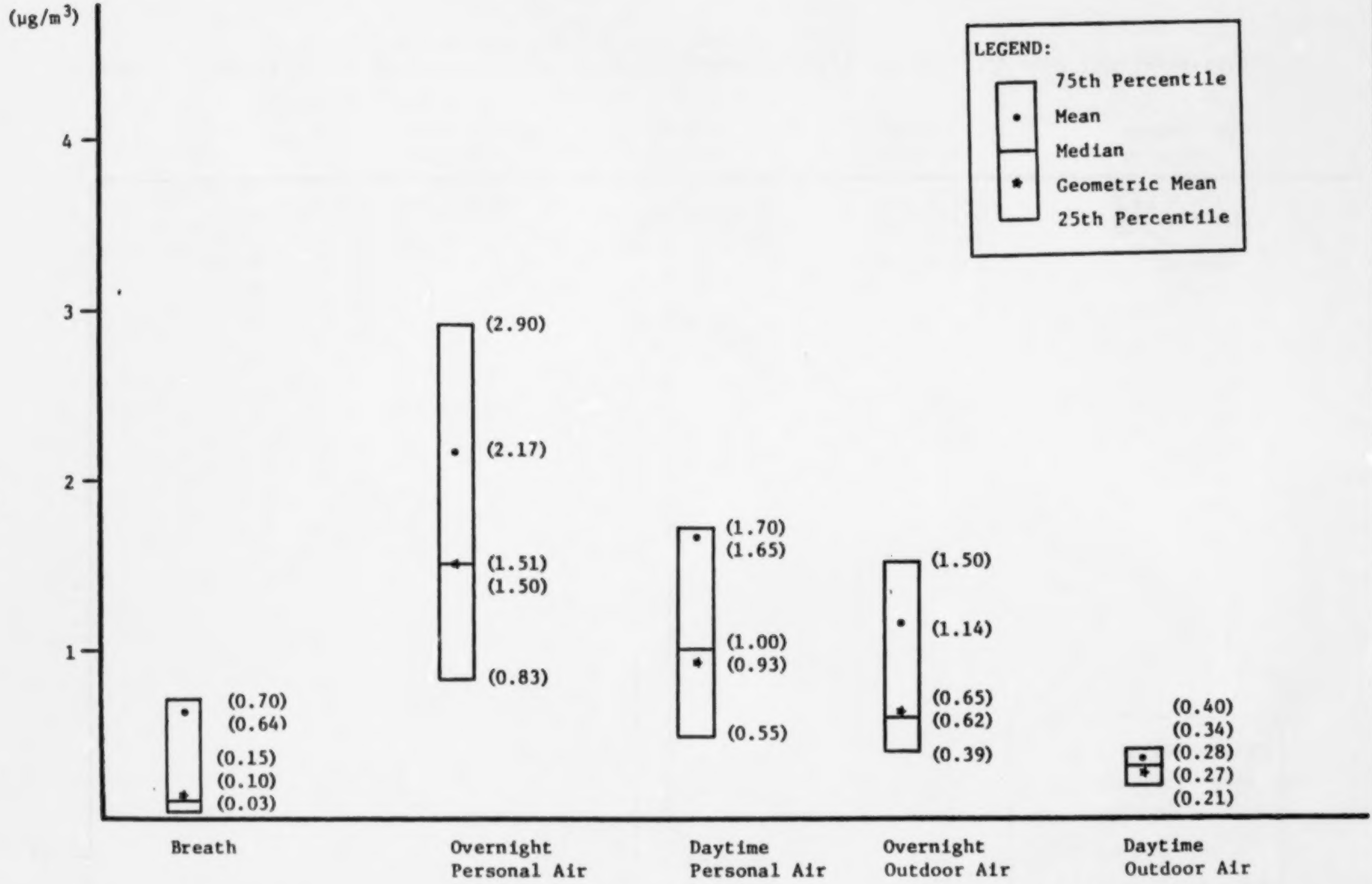


Figure 10. Box plots for weighted arithmetic means, geometric means, medians, 25th and 75th percentiles for chloroform - Los Angeles first season.

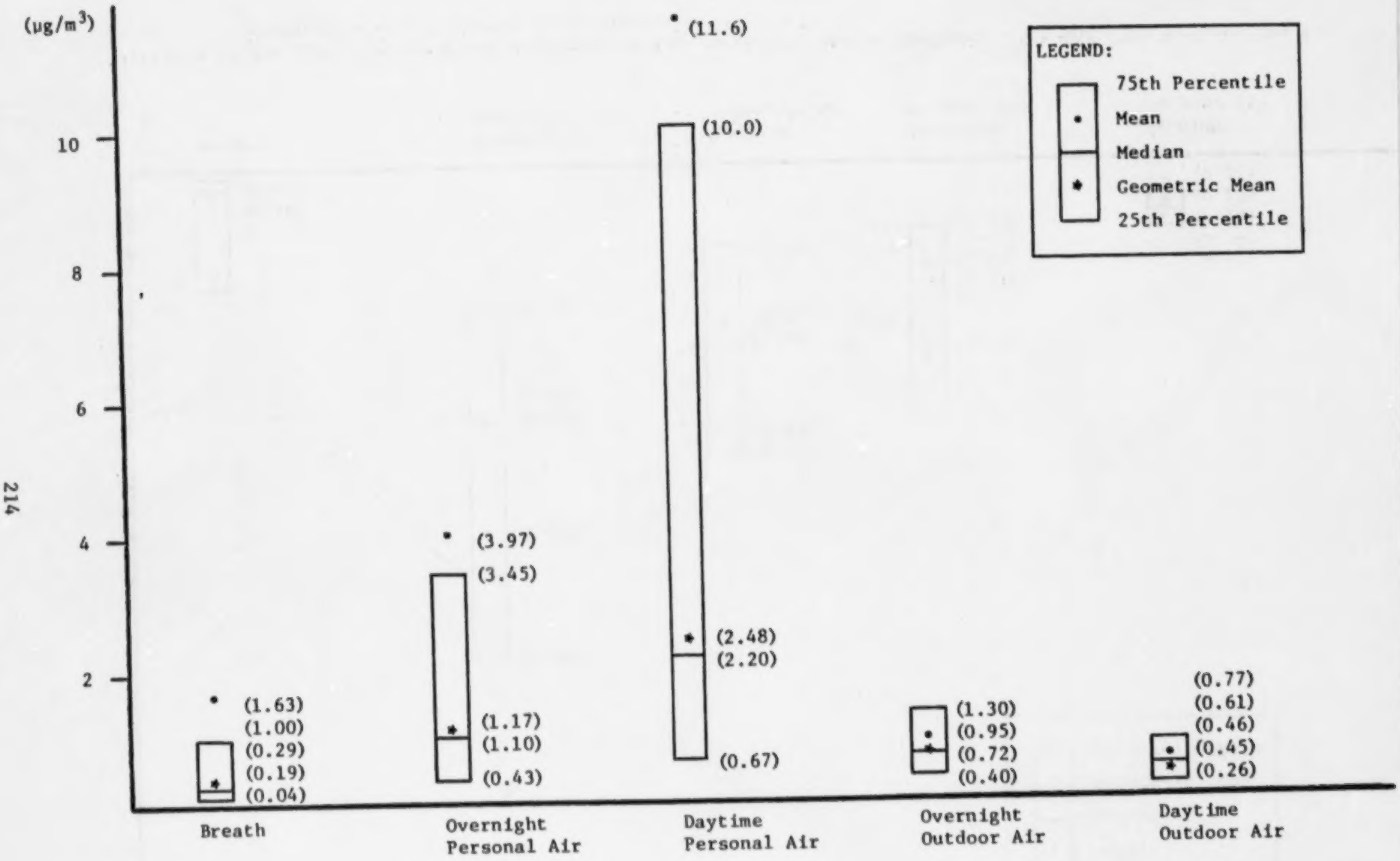


Figure 11. Box plots for weighted arithmetic means, geometric means, medians, 25th and 75th percentiles for trichloroethylene - Los Angeles first season.

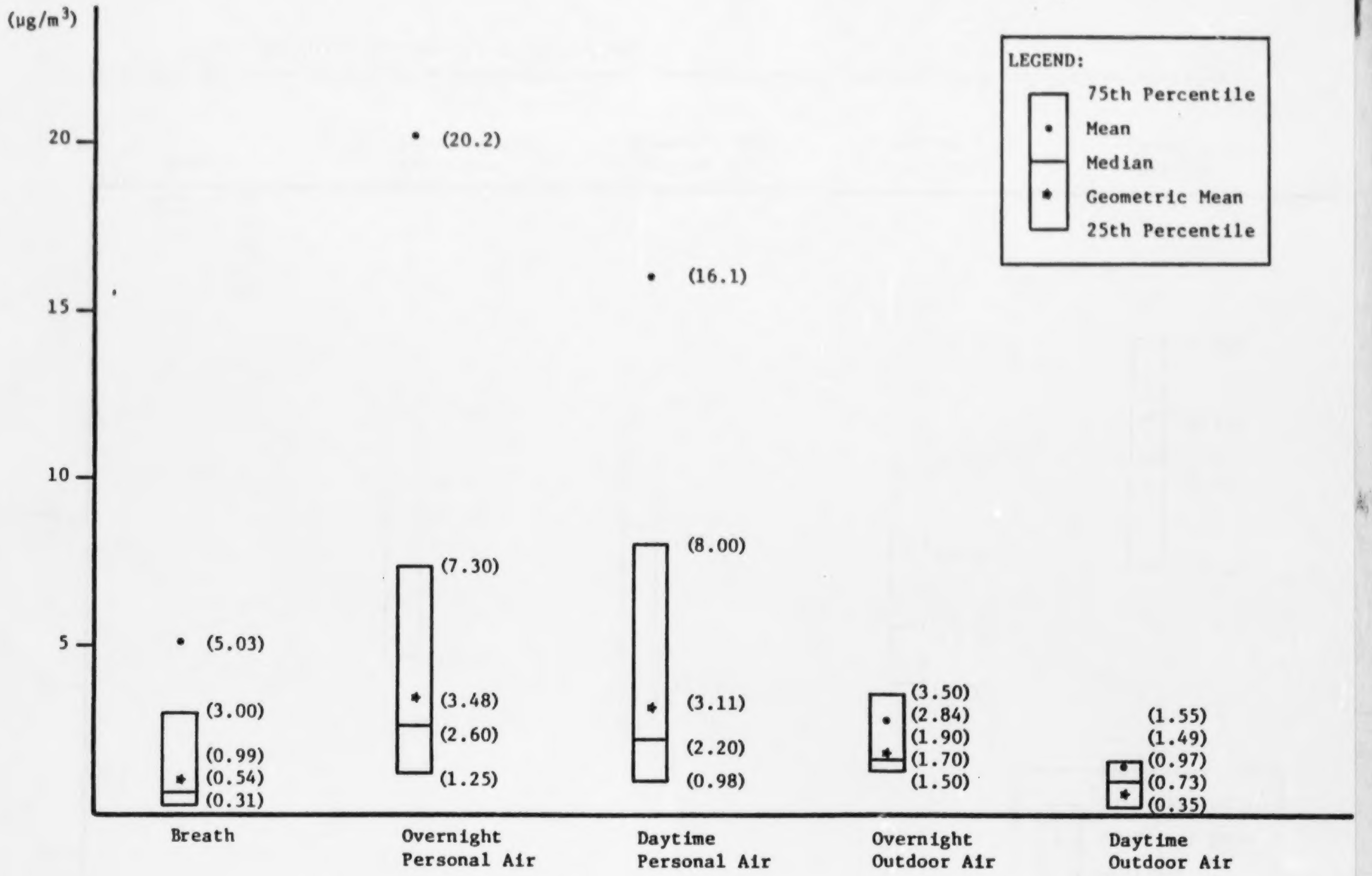


Figure 12. Box plots for weighted arithmetic means, geometric means, medians, 25th and 75th percentiles for m,p-Dichlorobenzene - Los Angeles first season.

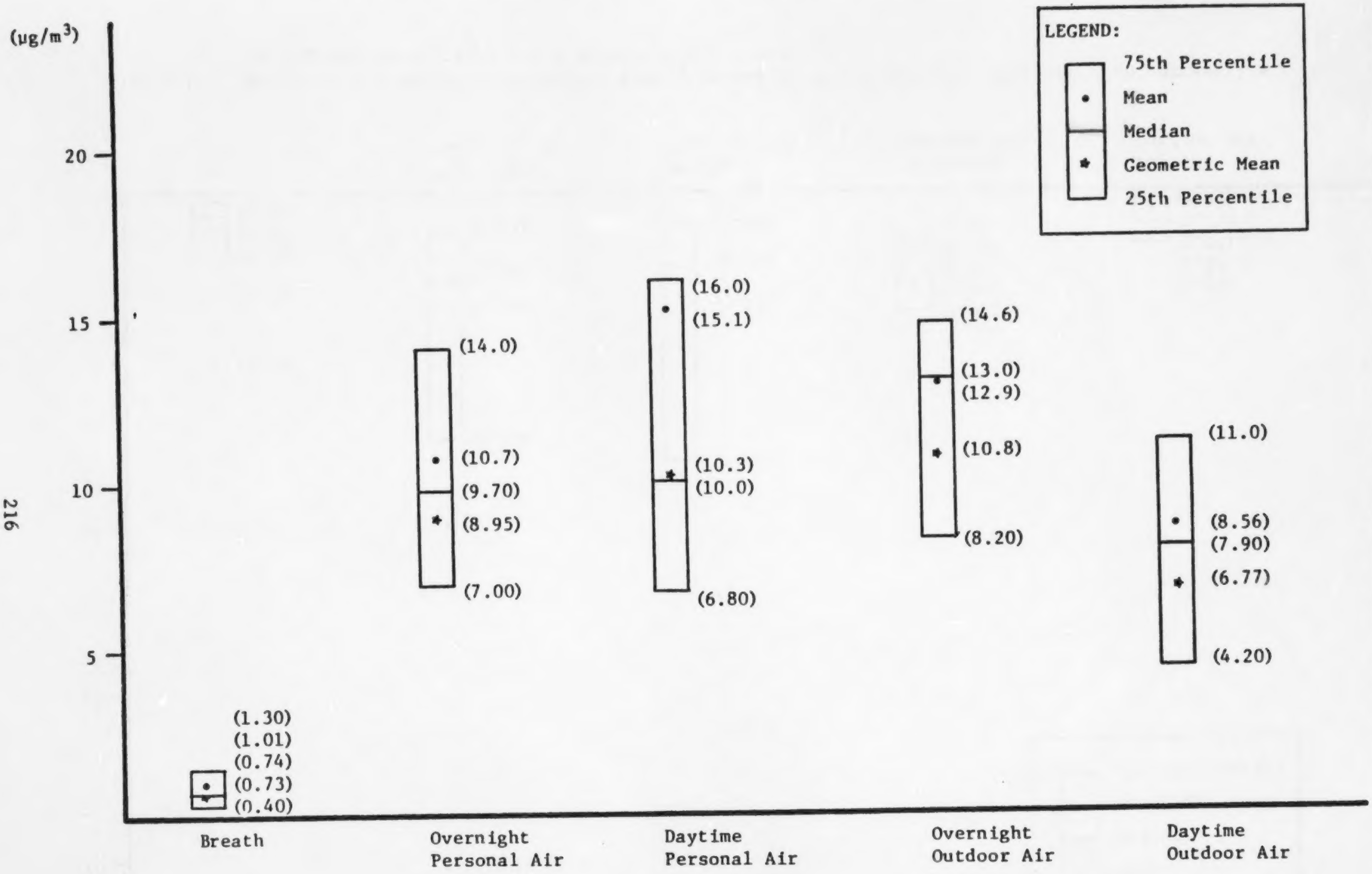


Figure 13. Box plots for weighted arithmetic means, geometric means, medians, 25th and 75th percentiles for o-Xylene - Los Angeles first season.

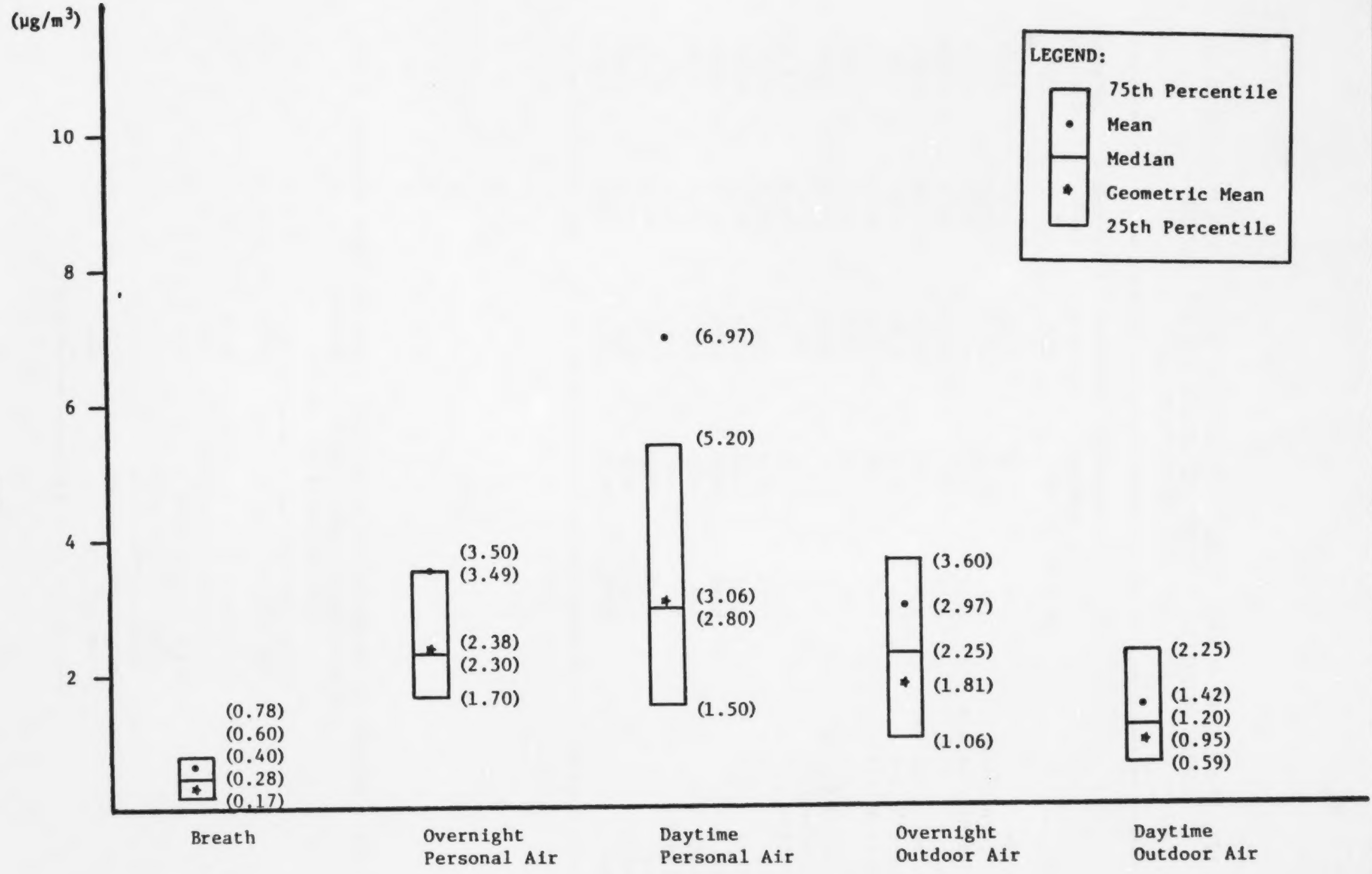


Figure 14. Box plots for weighted arithmetic means, geometric means, medians, 25th and 75th percentiles for n-Undecane - Los Angeles first season.

TABLE 107. SUMMARY OF THE MAGNITUDE OF SELECTED COMPOUND LEVELS COMPARED TO THE MEDIAN QUANTIFIABLE LIMITS FOR BREATH AND AIR SAMPLES -- LOS ANGELES FIRST SEASON

Compound	Breath	Overnight Personal Air	Daytime Personal Air	Overnight Outdoor Air	Daytime Outdoor Air
Chloroform	low	high	high	high	high
1,2-Dichloroethane	low	high	high	high	low
1,1,1-Trichloroethane	high	high	high	high	high
Benzene	high	high	high	high	high
Carbon Tetrachloride	low	high	high	high	high
Trichloroethylene	low	high	high	high	high
Tetrachloroethylene	high	high	high	high	high
Styrene	low	high	high	high	high
m,p-Dichlorobenzene	high	high	high	high	high
o-Dichlorobenzene	low	low	low	high	low
Ethylbenzene	high	high	high	high	high
o-Xylene	high	high	high	high	high
m,p-Xylene	high	high	high	high	high
n-Decane	high	high	high	high	high
n-Dodecane	low	high	high	high	high
1,4-Dioxane	low	low	low	high	low
n-Octane	high	high	high	high	high
n-Undecane	high	high	high	high	high
a-Pinene	high	high	high	high	high

TABLE 108. SUMMARY OF THE MAGNITUDE OF SELECTED COMPOUND LEVELS COMPARED TO THE MEDIAN QUANTIFIABLE LIMITS FOR WATER -- LOS ANGELES FIRST SEASON

Compound	Water
Chloroform	high
1,1,1-Trichloroethane	low
Trichloroethylene	low
Bromodichloromethane	high
Dibromochloromethane	high
Tetrachloroethylene	low
Bromoform	low

Generally, the correlations were less than .50 signifying a lack of strong correlation between the media. The strongest correlations appeared between breath and daytime personal air, overnight and daytime personal air, and overnight and daytime outdoor air. For overnight versus daytime personal air, all correlations were positive and significantly different from zero. Also, the compound m,p-dichlorobenzene showed a relatively strong correlation for each of the media pairs.

The Spearman correlations for all amounts between water and the other media (see Table 110) were all less than .25.

Tables 111 and 112 show the Spearman correlations among media for measurable amounts only. If the sample size was less than 5, the correlations were not reported. While there appeared to be some increase in the correlations as compared with all amounts, most were still less than .50. Again, m,p-dichlorobenzene appeared to have the strongest correlations for breath and air. Also, there seemed to be a strong correlation (.89) between water and daytime outdoor air for tetrachloroethylene.

Figures 15 through 38 show scatter plots for breath versus daytime personal air, breath versus daytime outdoor air, and overnight personal air versus overnight outdoor air for selected compounds on the natural logarithmic scale. One was added to each number before the logarithm was taken. The lines on the figures represent the median QL values for the compounds for the two media. An "O" represents both concentrations measurable and an "X" represents one or both not measurable. The correlations for all amounts and measurable amounts only are also given. These plots demonstrate the lack of strong correlation between the media and large scatter in the levels, but also demonstrate that there were positive trends between media for several of the compounds investigated.

OUTDOOR VERSUS PERSONAL AIR

To gain additional insight into the comparison between overnight personal air and overnight outdoor air, Tables 113 through 115 compared unweighted percents of concentrations measurable and unweighted summary statistics for the 25 people in Los Angeles who provided both overnight personal air and overnight outdoor air data. The fixed-sites at which outdoor air data was collected were in the vicinity of the subjects' homes.

TABLE 109. SPEARMAN CORRELATIONS BETWEEN MEDIA FOR ALL AMOUNTS OF SELECTED COMPOUNDS -- LOS ANGELES FIRST SEASON

	Breath and Overnight Personal Air		Breath and Daytime Personal Air		Breath and Overnight Outdoor Air		Breath and Daytime Outdoor Air		Overnight Personal Air and Daytime Personal Air	
Compound	Spearman Corre-lation	Sample Size	Spearman Corre-lation	Sample Size	Spearman Corre-lation	Sample Size	Spearman Corre-lation	Sample Size	Spearman Corre-lation	Sample Size
Chloroform	-.09	109	.02	105	.21	21	-.06	21	.27*	107
1,2-Dichloroethane	.02	108	-.06	105	.15	21	-.00	20	.34*	106
1,1,1-Trichloroethane	.24*	112	.57*	112	.06	24	-.17	24	.27*	111
Benzene	.16	112	.20*	112	.02	24	-.18	24	.39*	111
Carbon Tetrachloride	.11	109	-.00	108	-.24	21	-.26	22	.22*	110
Trichloroethylene	.28*	108	.68*	107	.04	21	-.24	21	.36*	107
Tetrachloroethylene	.35*	111	.32*	112	.14	24	.11	24	.45*	110
Styrene	.15	109	.20*	110	.18	23	.17	23	.46*	110
m,p-Dichlorobenzene	.66*	109	.69*	109	.67*	22	.69*	22	.69*	109
o-Dichlorobenzene	.01	107	-.05	107	-.32	22	.04	21	.21*	106
Ethylbenzene	.26*	110	.45*	111	.05	24	-.01	24	.35*	110
o-Xylene	.23*	110	.40*	111	.01	24	.10	24	.28*	110
m,p-Xylene	.22*	111	.42*	112	.02	24	.02	24	.32*	110
n-Decane	.13	109	.75*	109	-.08	23	.14	24	.27*	107
n-Dodecane	.08	107	.14	108	.54*	21	.33	22	.44*	108
1,4-Dioxane	-.09	107	.01	108	-.03	21	-.44	20	.22*	108
n-Octane	.15	109	.16	110	.42	22	-.29	23	.26*	110
n-Undecane	.29*	110	.19	111	.17	24	.24	24	.43*	110
a-Pinene	.20*	110	.21*	111	.04	23	-.01	22	.29*	110

continued

TABLE 109. continued

Compound	Overnight Personal Air and Overnight Outdoor Air		Overnight Personal Air and Daytime Outdoor Air		Daytime Personal Air and Overnight Outdoor Air		Daytime Personal Air and Daytime Outdoor Air		Overnight Outdoor Air and Daytime Outdoor Air	
	Spearman Corre- lation	Sample Size	Spearman Corre- lation	Sample Size	Spearman Corre- lation	Sample Size	Spearman Corre- lation	Sample Size	Spearman Corre- lation	Sample Size
Chloroform	.04	24	-.01	24	.18	22	.24	22	.45*	23
1,2-Dichloroethane	.48*	24	.03	23	.54*	22	.35	21	.22	23
1,1,1-Trichloroethane	.54*	25	-.00	25	.20	24	.37	24	.32	25
Benzene	.15	25	-.11	25	.19	24	.50*	24	.58*	25
Carbon Tetrachloride	.23	24	.22	25	.39	22	.25	23	.32	24
Trichloroethylene	.18	23	-.06	23	.07	23	.03	23	.43*	23
Tetrachloroethylene	.63*	25	.30	25	.45*	24	.55*	24	.50*	25
Styrene	.41*	25	-.07	25	.05	24	.20	24	.15	25
m,p-Dichlorobenzene	.56*	24	.40	24	.43*	23	.51*	23	.49*	23
o-Dichlorobenzene	.24	24	.03	23	-.17	22	.03	21	-.24	23
Ethylbenzene	.36	25	-.23	25	.26	24	.19	24	.56*	25
o-Xylene	.28	25	-.21	25	.20	24	.30	24	.51*	25
m,p-Xylene	.21	25	-.20	25	.25	24	.30	24	.58*	25
n-Decane	.63*	24	.10	25	.16	21	-.16	22	.52*	24
n-Dodecane	.03	24	-.26	25	.09	23	-.24	24	.56*	24
1,4-Dioxane	-.04	24	.14	23	.38	23	.66*	22	.40	23
n-Octane	.32	24	.03	25	.29	23	.31	24	.15	24
n-Undecane	.31	25	-.19	25	.03	24	-.08	24	.56*	25
a-Pinene	.34	24	.34	23	.23	23	.38	22	.42*	23

* Significantly different from zero at .05 level.

TABLE 110. SPEARMAN CORRELATIONS BETWEEN WATER AND THE OTHER MEDIA FOR ALL AMOUNTS OF SELECTED COMPOUNDS -- LOS ANGELES FIRST SEASON

Compound	Breath		Overnight Personal Air		Daytime Personal Air		Overnight Outdoor Air		Daytime Outdoor Air	
	Spearman Correlation	Sample Size	Spearman Correlation	Sample Size	Spearman Correlation	Sample Size	Spearman Correlation	Sample Size	Spearman Correlation	Sample Size
Chloroform	.22*	112	.09	114	.24*	110	-.25	24	.24	24
1,1,1-Trichloroethane	.03	115	.00	114	.02	114	-.31	25	.09	25
Trichloroethylene	.13	112	-.17	112	.09	112	-.17	24	-.21	24
Bromodichloromethane	.01	112		a/						
Dibromochloromethane	.06	112		a/						
Tetrachloroethylene	.23*	115	-.02	113	.05	114	-.05	25	.19	25
Bromoform	-.04	112		a/						

* Significantly different from zero at .05 level.

a/ Compounds not analyzed in personal air or outdoor air samples.

TABLE III. SPEARMAN CORRELATIONS BETWEEN MEDIA FOR MEASURABLE AMOUNTS ONLY OF SELECTED COMPOUNDS -- LOS ANGELES FIRST SEASON

Compound	Breath and Overnight Personal Air		Breath and Daytime Personal Air		Breath and Overnight Outdoor Air		Breath and Daytime Outdoor Air		Overnight Personal Air and Daytime Personal Air	
	Spearman Correlation	Sample Size	Spearman Correlation	Sample Size	Spearman Correlation	Sample Size	Spearman Correlation	Sample Size	Spearman Correlation	Sample Size
Chloroform	.04	42	-.06	36	-.11	7	.60	5	.37*	101
1,2-Dichloroethane		4		4		1		0	.12	53
1,1,1-Trichloroethane	.76*	111	.57*	112	.06	24	-.17	24	.29*	110
Benzene	.13	108	.25*	108	-.10	21	-.04	21	.39*	111
Carbon Tetrachloride	.01	9	-.32	11		1		2	.23*	104
Trichloroethylene	-.03	47	.74*	52	.71*	8	-.05	8	.38*	91
Tetrachloroethylene	.35*	111	.32*	112	.14	23	.11	24	.45*	110
Styrene	.15	53	.31*	53	.31	15	.08	14	.42*	105
m,p-Dichlorobenzene	.68*	82	.71*	83	.65*	16	.54*	16	.68*	102
o-Dichlorobenzene		2		1		1		1	.15	15
Ethylbenzene	.21*	91	.31*	91	-.03	21	-.12	21	.35*	110
o-Xylene	.22*	101	.39*	102	-.22	20	.14	20	.28*	109
m,p-Xylene	.22*	111	.42*	112	.02	24	.02	24	.32*	110
n-Decane	.13	54	.22	57	-.05	16	-.09	17	.27*	94
n-Dodecane	.12	34	.23	33	.76*	11	.33	10	.39*	100
1,4-Dioxane		2		3		2		0	.02	31
n-Octane	.13	88	.31*	86	-.06	17	-.07	17	.27*	107
n-Undecane	.07	63	.10	63	.35	17	.22	17	.39*	108
a-Pinene	.26*	100	.21*	91	-.10	20	-.15	11	.38*	97

continued

TABLE III. continued

Compound	Overnight Personal Air and Overnight Outdoor Air		Overnight Personal Air and Daytime Outdoor Air		Daytime Personal Air and Overnight Outdoor Air		Daytime Personal Air and Daytime Outdoor Air		Overnight Personal Air and Daytime Outdoor Air	
	Spearman Corre- lation	Sample Size	Spearman Corre- lation	Sample Size	Spearman Corre- lation	Sample Size	Spearman Corre- lation	Sample Size	Spearman Corre- lation	Sample Size
Chloroform	.15	22	.05	19	.11	20	.07	17	.34	16
1,2-Dichloroethane	.27	17		2	-.05	11		3		3
1,1,1-Trichloroethane	.54*	25	-.00	25	.20	24	.32	24	.32	25
Benzene	.15	25	-.11	25	.19	24	.50*	24	.58*	25
Carbon Tetrachloride	.37	22	.25	24	.47*	20	.27	22	.26	23
Trichloroethylene	.32	21	.02	18	.21*	22	-.07	20	.10	19
Tetrachloroethylene	.65*	24	.30	25	.37	23	.55*	24	.48*	24
Styrene	.41*	25	-.13	23	.05	24	.16	22	.12	23
m,p-Dichlorobenzene	.56*	24	.45*	22	.43*	23	.49*	21	.57*	21
o-Dichlorobenzene		4		3		3		2		3
Ethylbenzene	.28	24	-.23	25	.15	23	.19	24	.51*	24
o-Xylene	.28	25	-.21	25	.22	23	.33	23	.51*	25
m,p-Xylene	.21	25	-.20	25	.25	24	.30	24	.58*	25
n-Decane	.53*	20	.07	21	.34	17	-.09	19	.44*	21
n-Dodecane	-.07	22	-.21	20	.08	21	-.10	19	.63*	18
1,4-Dioxane	.69*	10	.56	5	.13	9	.36	5	.17	6
n-Octane	.28	22	.03	24	.40	20	.38	22	.40	21
n-Undecane	.28	24	-.23	24	.14	23	-.22	23	.46*	23
a-Pinene	.33	22	.31	13	.32	16	.17	11	.29	12

* Significantly different from zero at .05 level.

TABLE 112. SPEARMAN CORRELATIONS BETWEEN WATER AND THE OTHER MEDIA FOR MEASURABLE AMOUNTS ONLY OF SELECTED COMPOUNDS -- LOS ANGELES FIRST SEASON

Compound	Breath		Overnight Personal Air		Daytime Personal Air		Overnight Outdoor Air		Daytime Outdoor Air	
	Spearman Correlation	Sample Size	Spearman Correlation	Sample Size	Spearman Correlation	Sample Size	Spearman Correlation	Sample Size	Spearman Correlation	Sample Size
Chloroform	.23	45	.08	106	.27*	98	-.05	22	-.13	19
1,1,1-Trichloroethane	-.07	55	-.02	53	.22	54	-.14	14	.41	14
Trichloroethylene		2	.32	7	.40	8		2		2
Bromodichloromethane		1								
Dibromochloromethane		0								
Tetrachloroethylene	.14	25	.16	24	.09	25	.71	7	.89*	8
Bromoform		0								

* Significantly different from zero at .05 level.

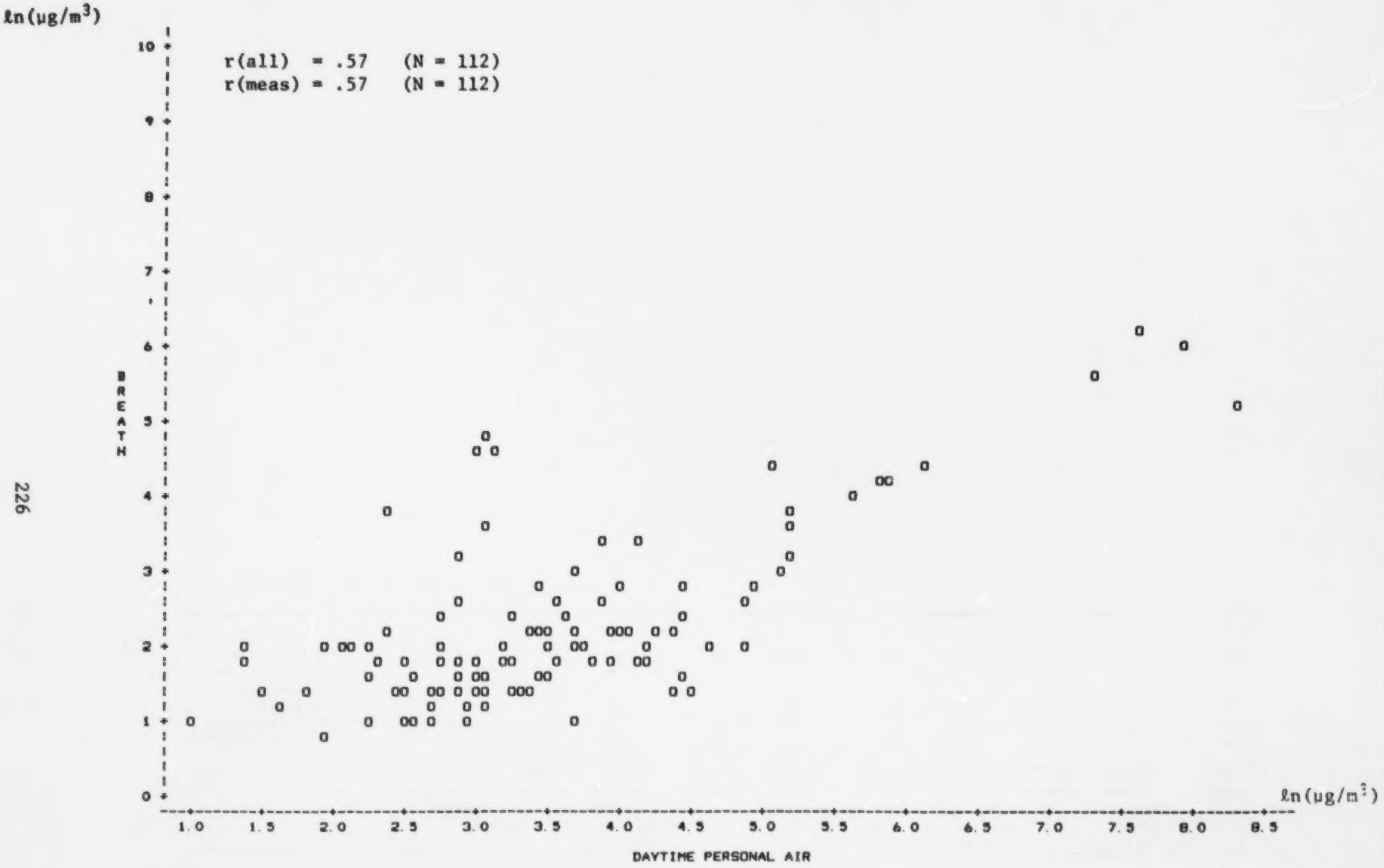


Figure 15. 1,1,1-Trichloroethane - Los Angeles first season.

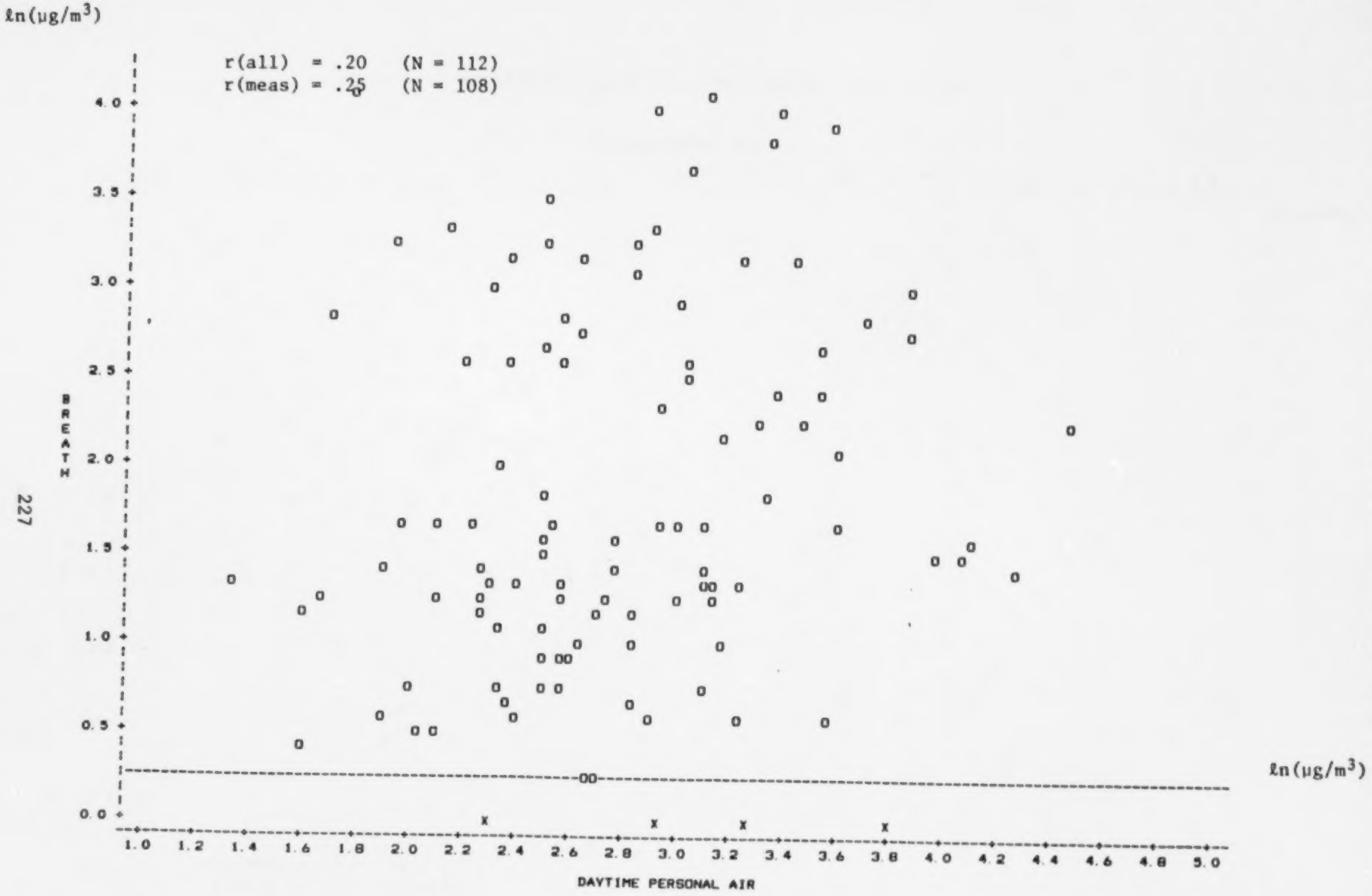


Figure 16. Benzene - Los Angeles first season.

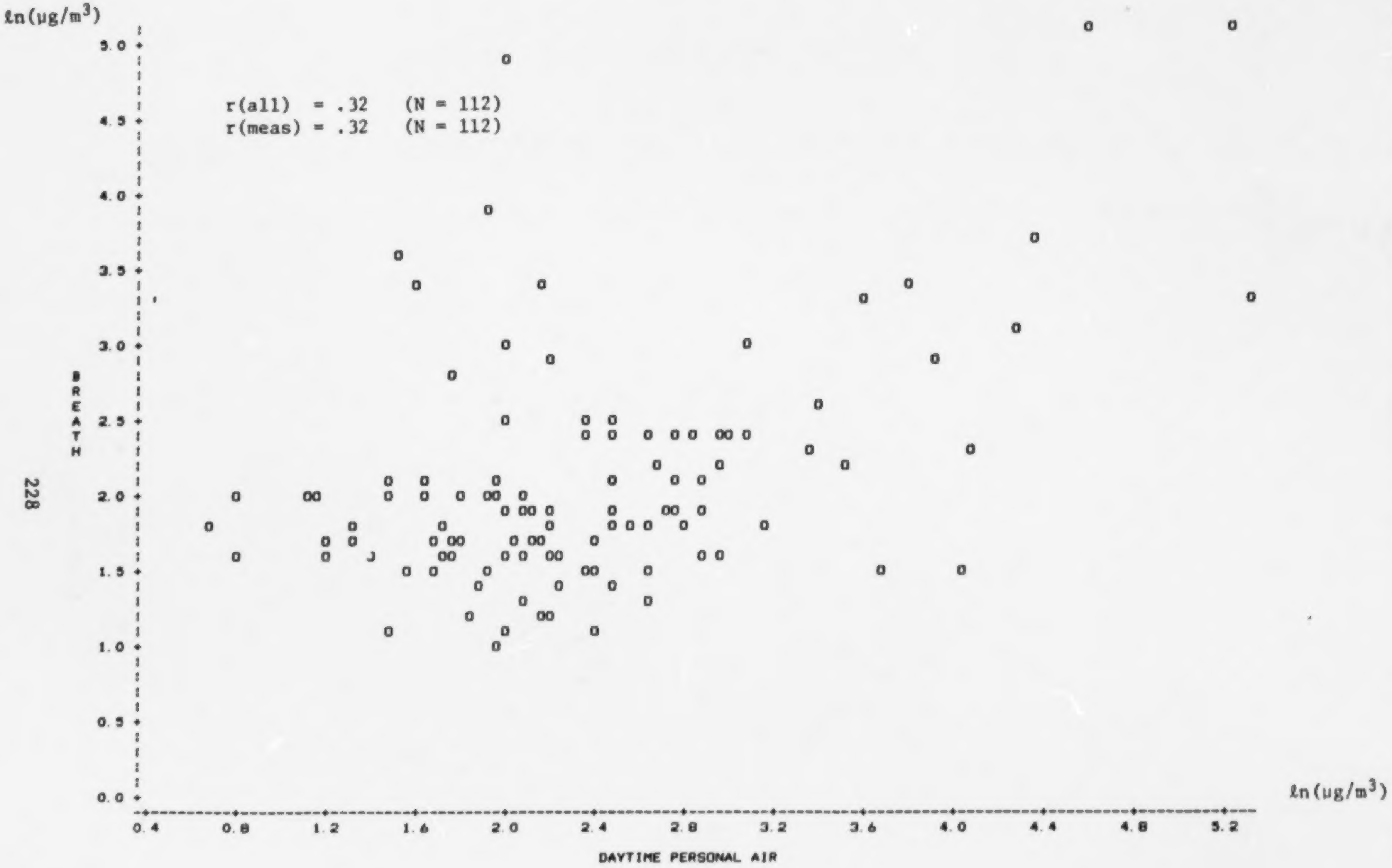


Figure 17. Tetrachloroethylene - Los Angeles first season.

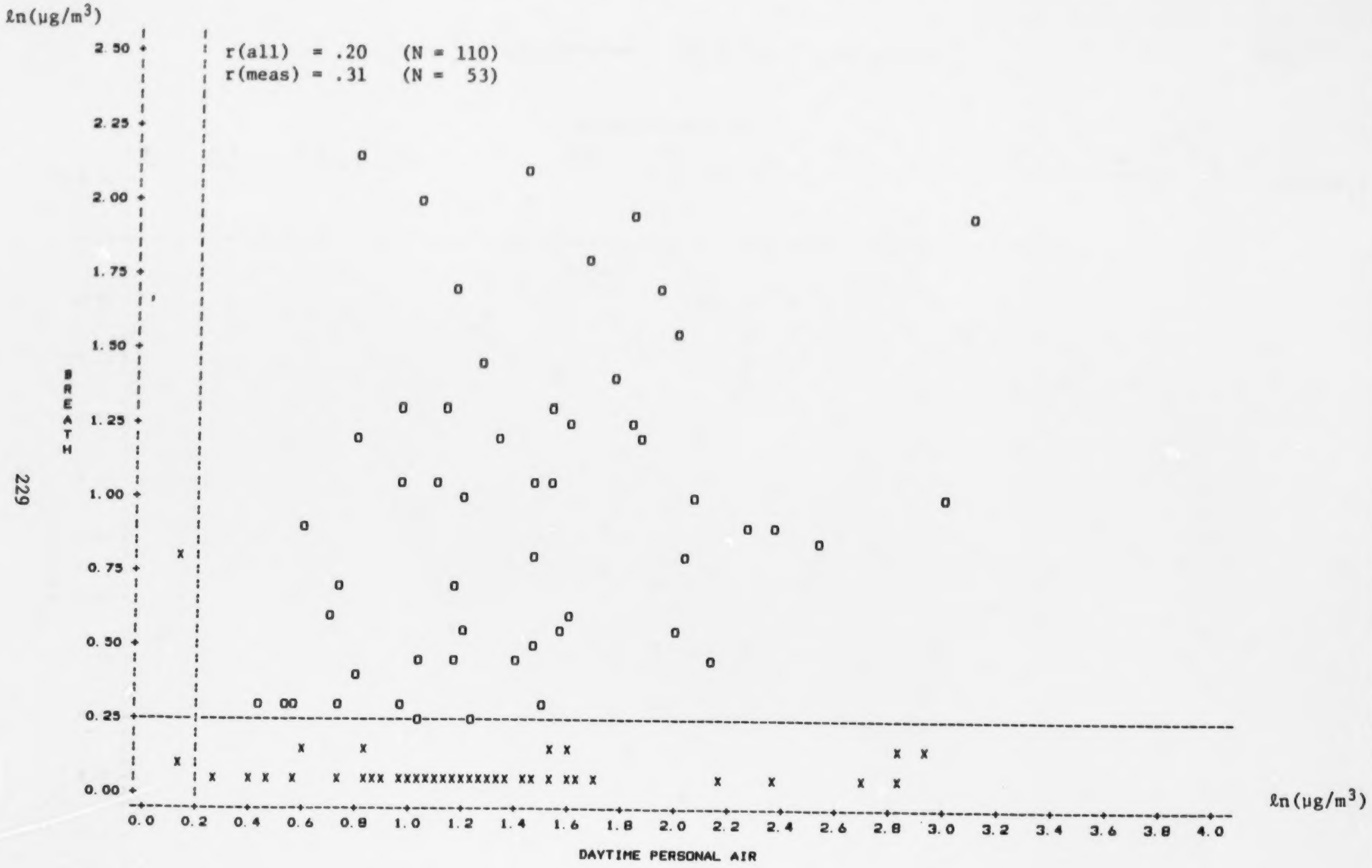


Figure 18. Styrene - Los Angeles first season.

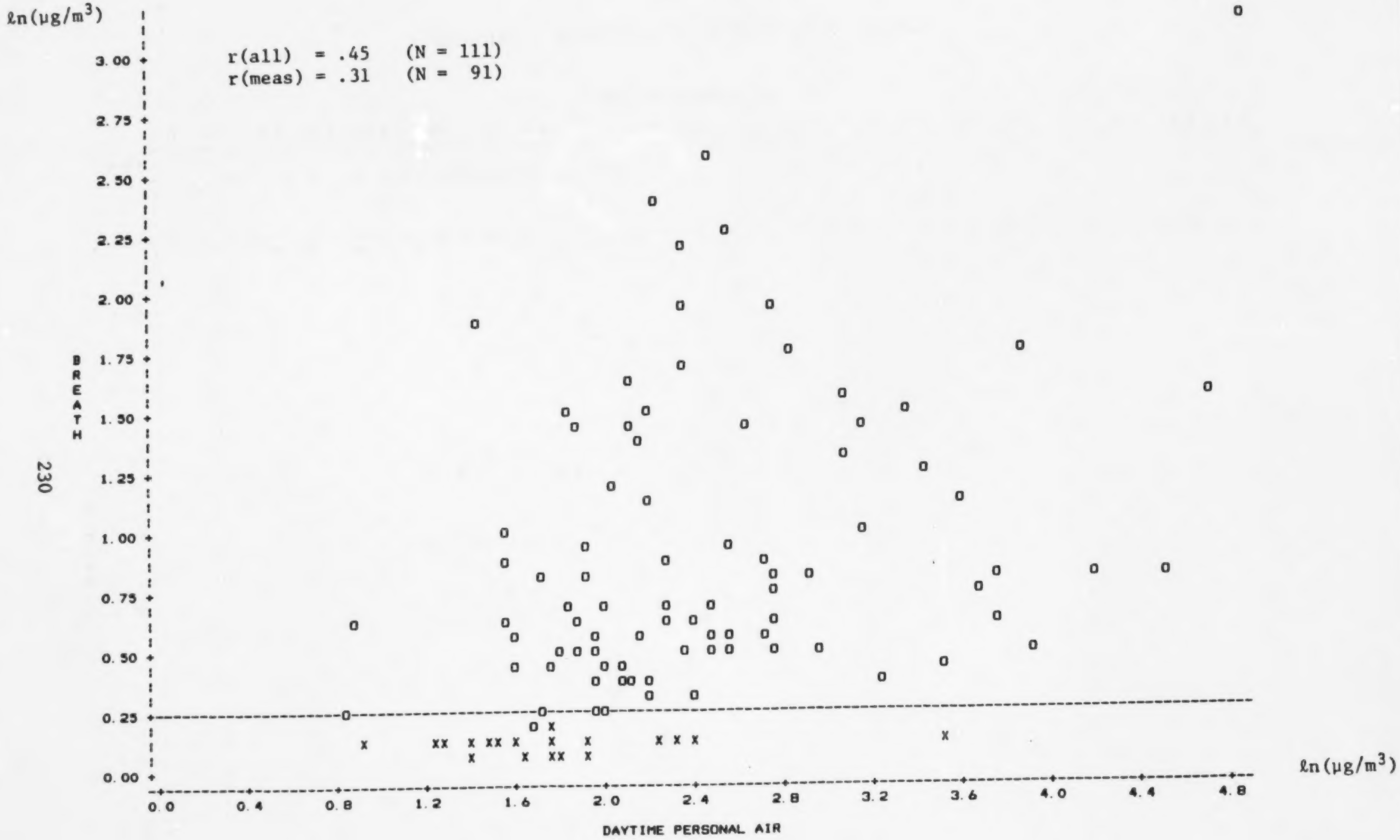


Figure 19. Ethylbenzene - Los Angeles first season.

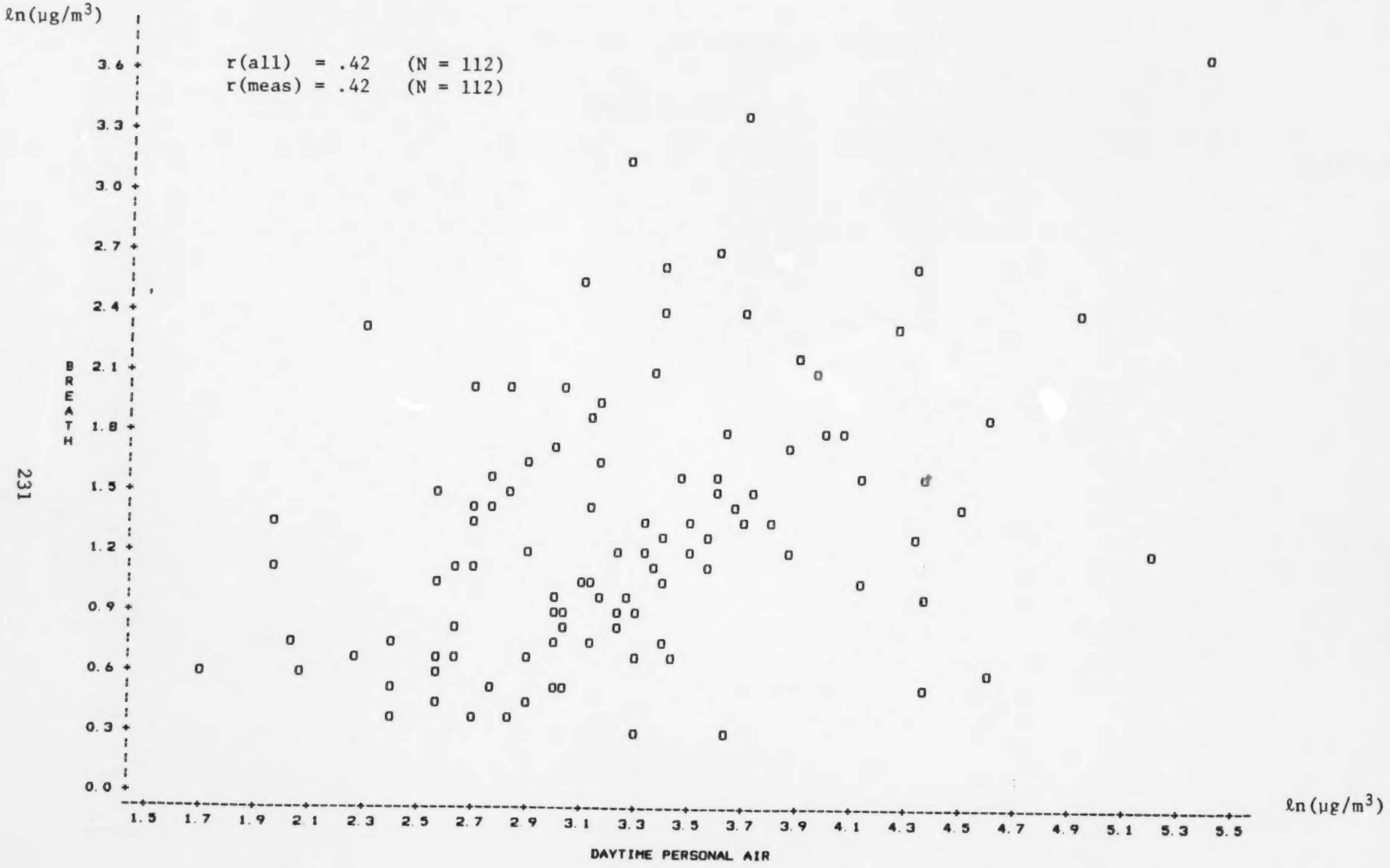


Figure 20. m,p-Xylene - Los Angeles first season.

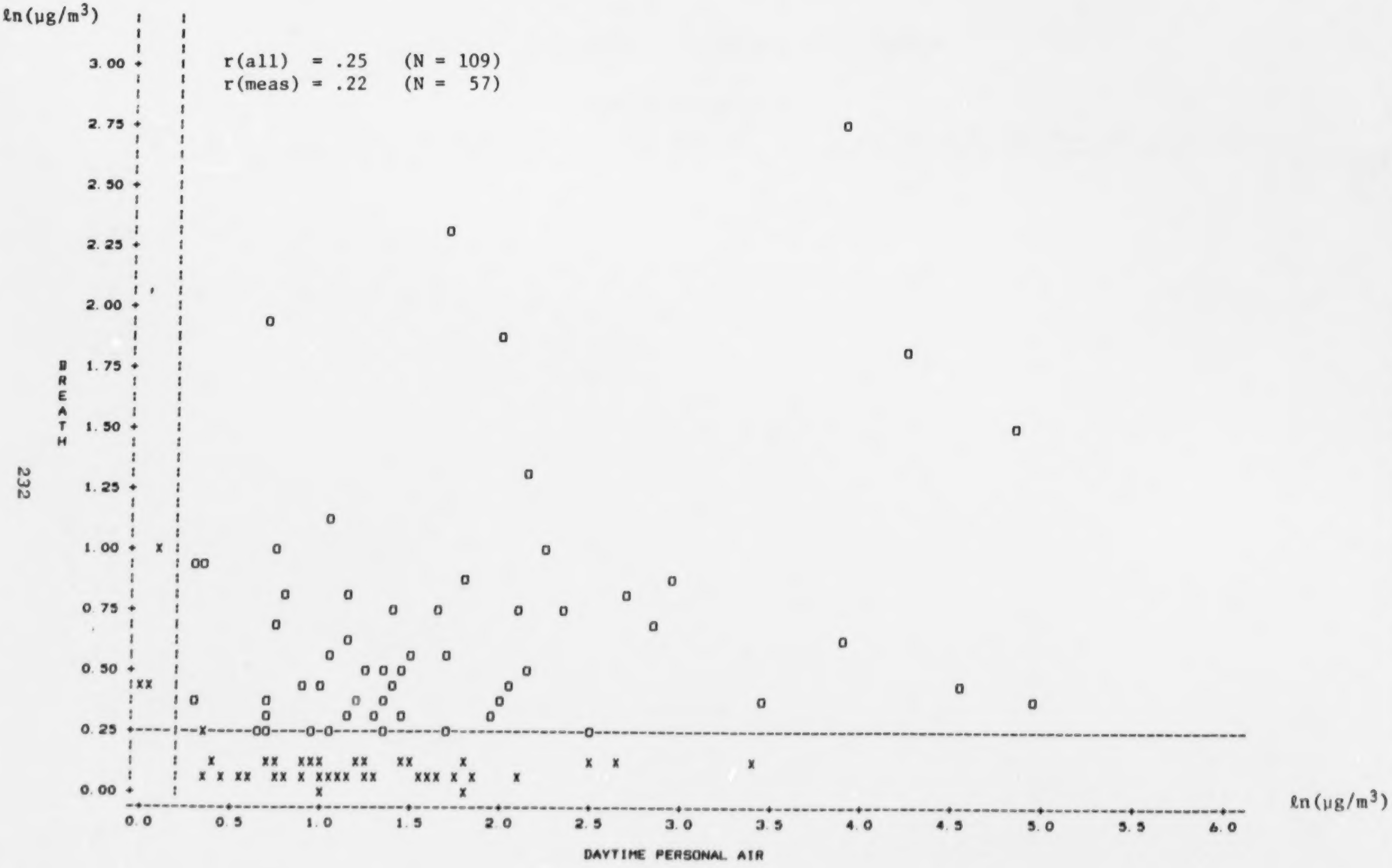


Figure 21. n-Decane - Los Angeles first season.

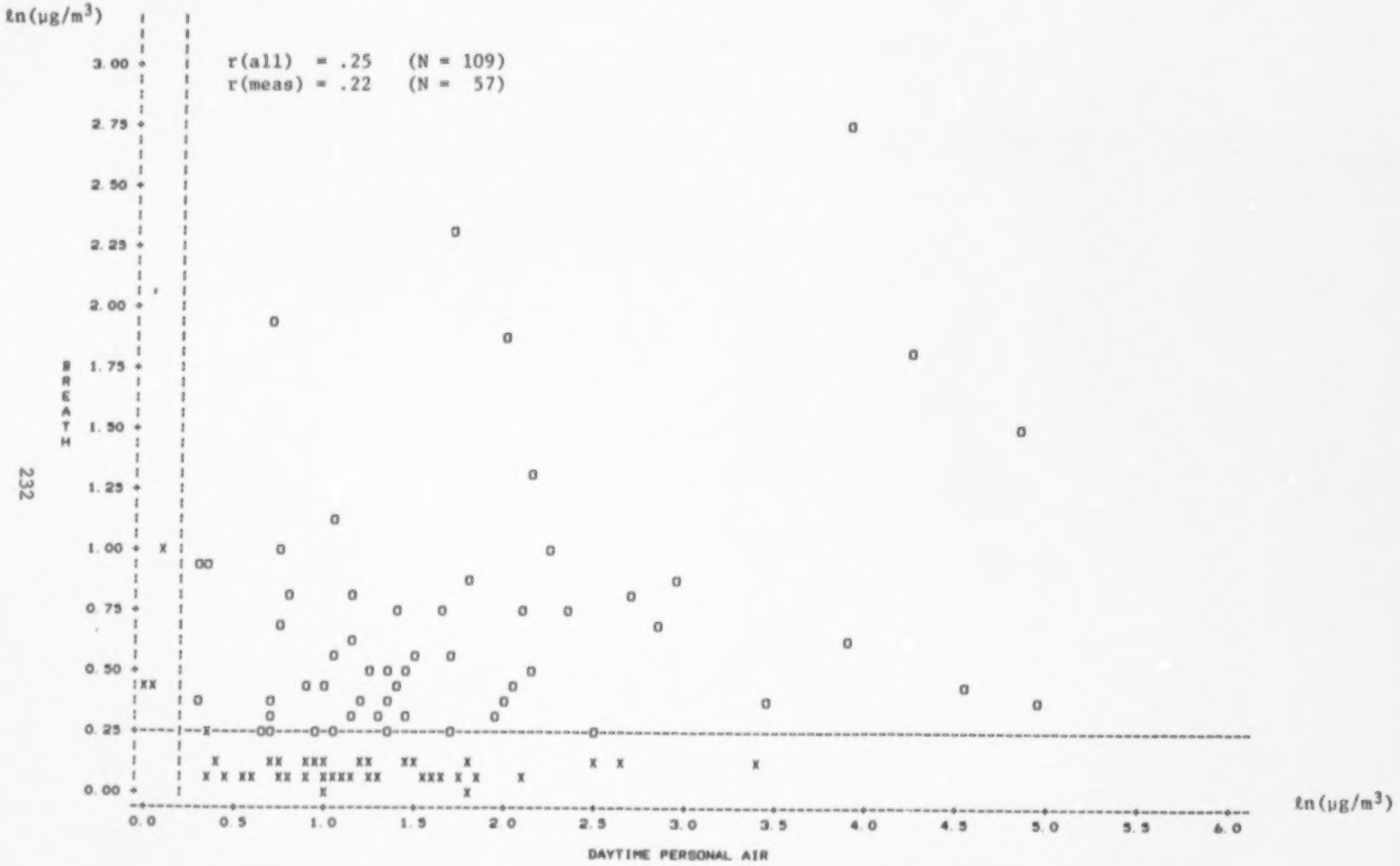


Figure 21. n-Decane - Los Angeles first season.

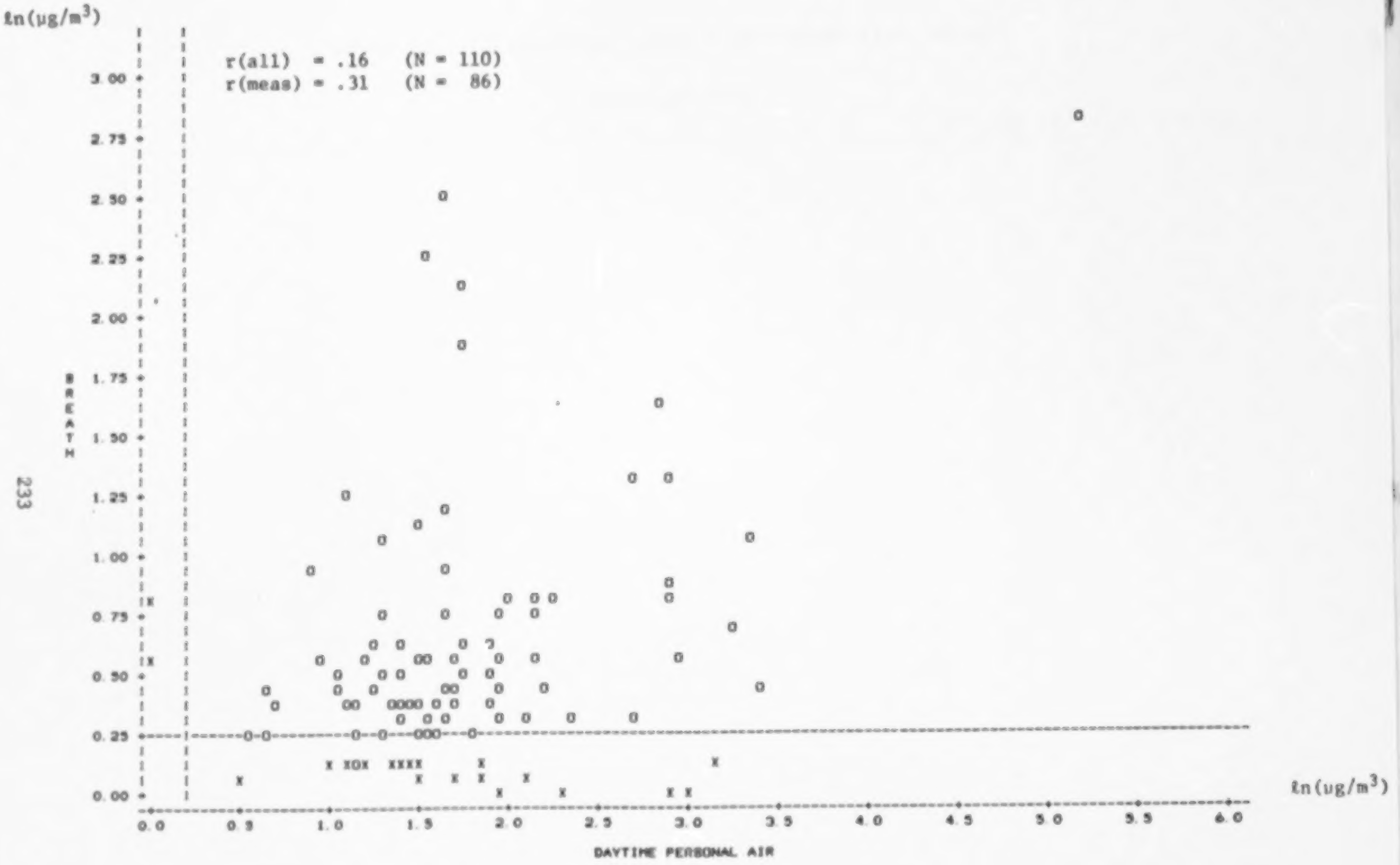


Figure 22. n-Octane - Los Angeles first season.

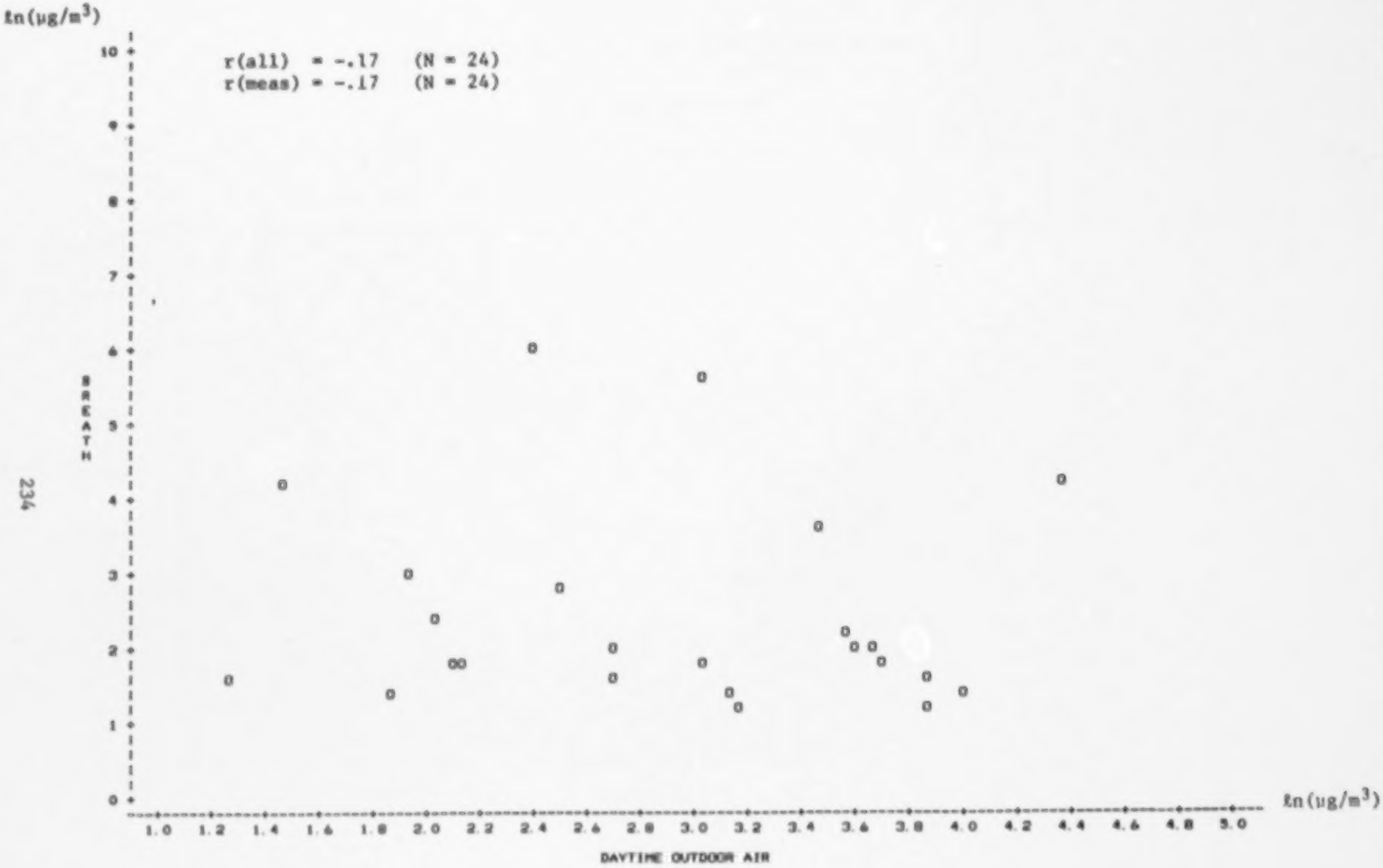


Figure 23. 1,1,1-Trichloroethane - Los Angeles first season.

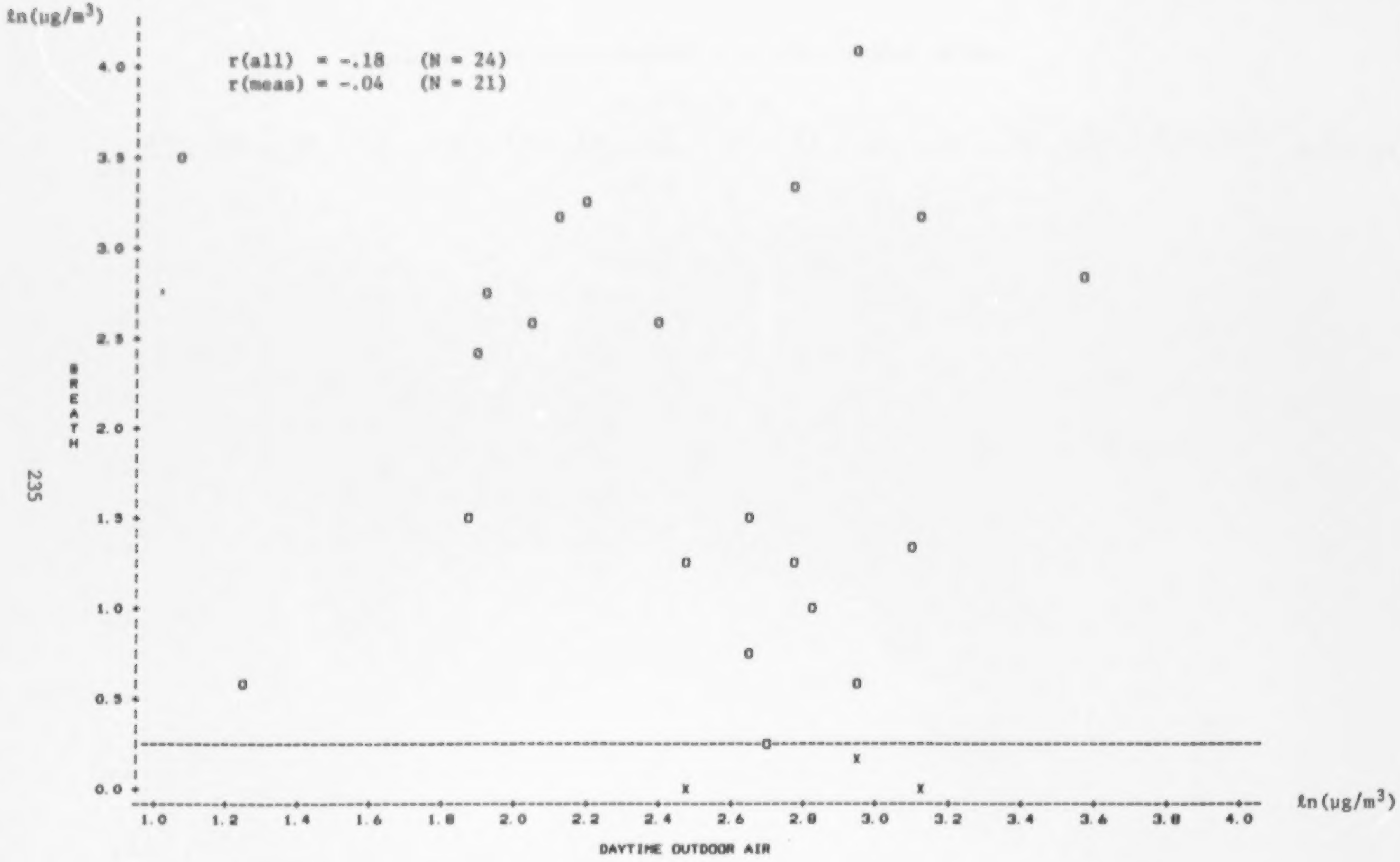


Figure 24. Benzene - Los Angeles first season.

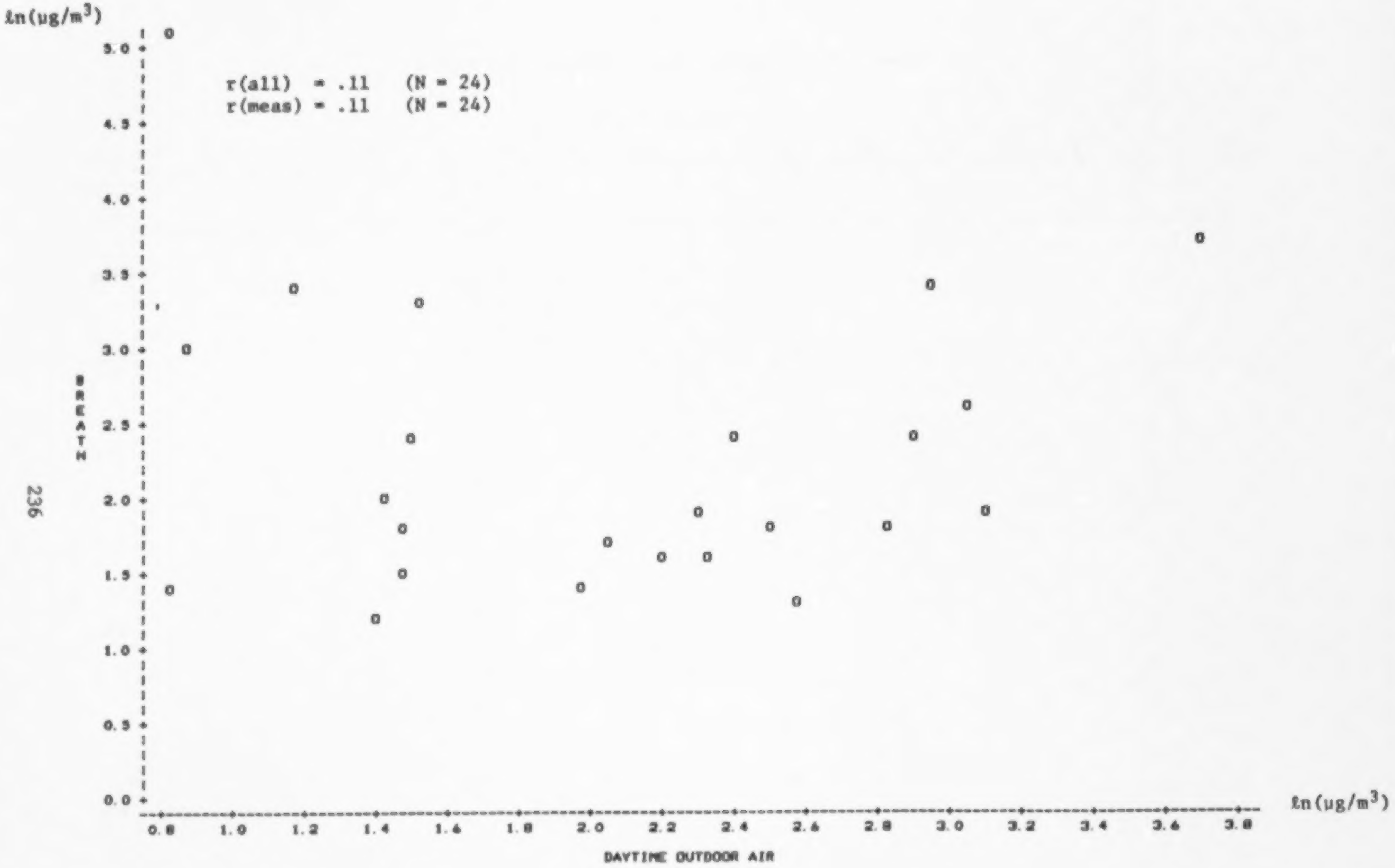


Figure 25. Tetrachloroethylene - Los Angeles first season.

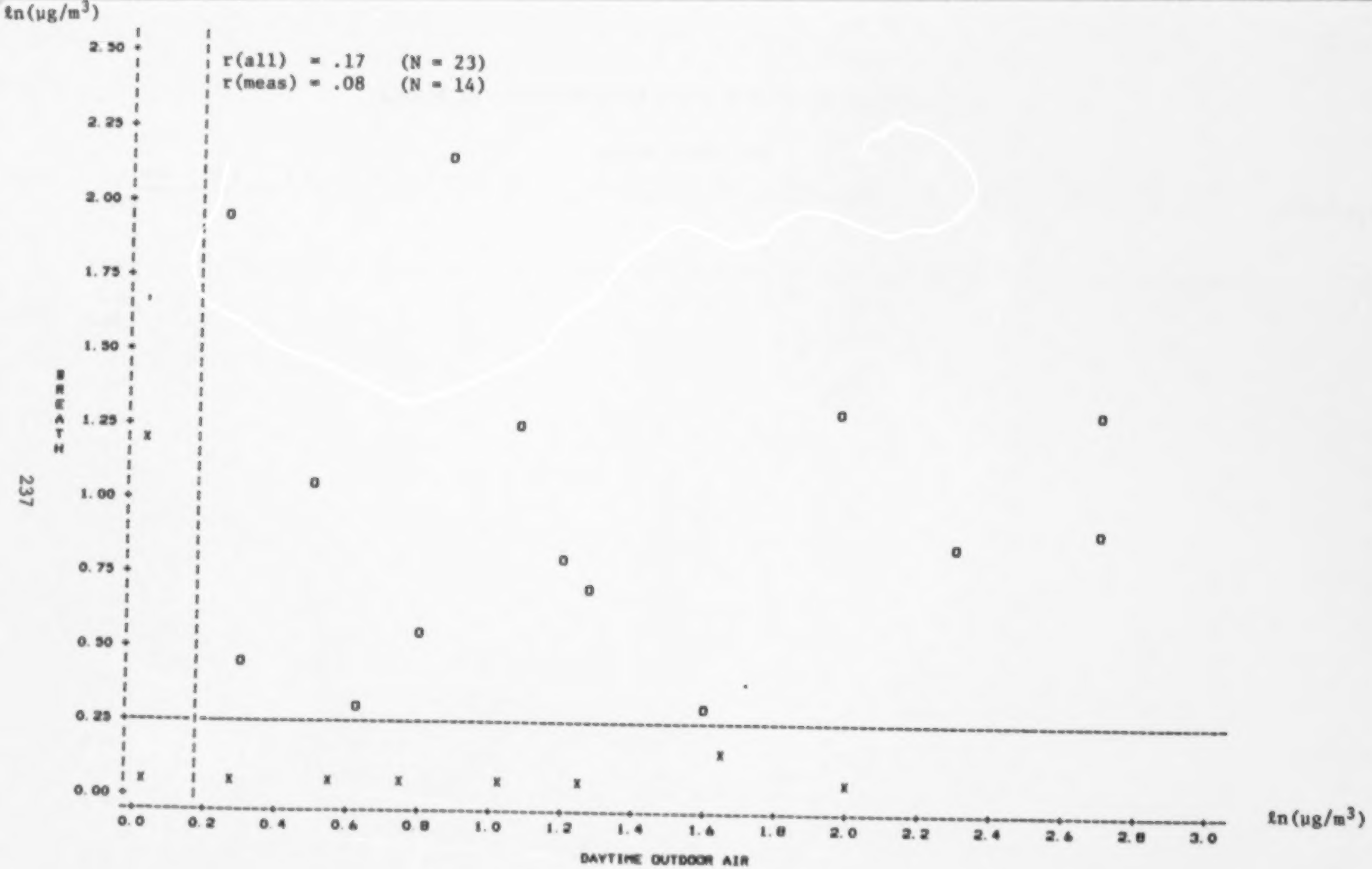


Figure 26. Styrene - Los Angeles first season.

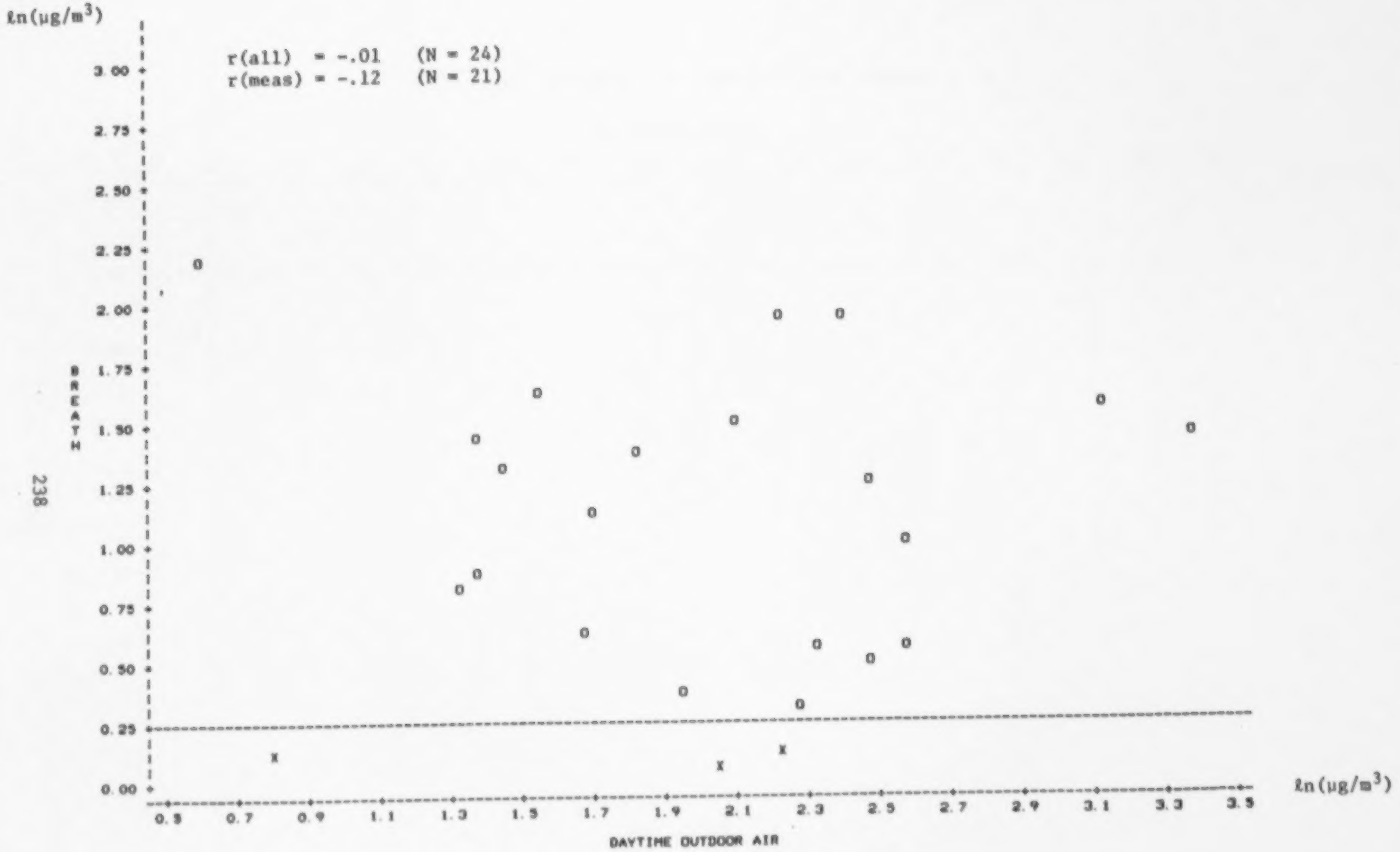


Figure 27. Ethylbenzene - Los Angeles first season.

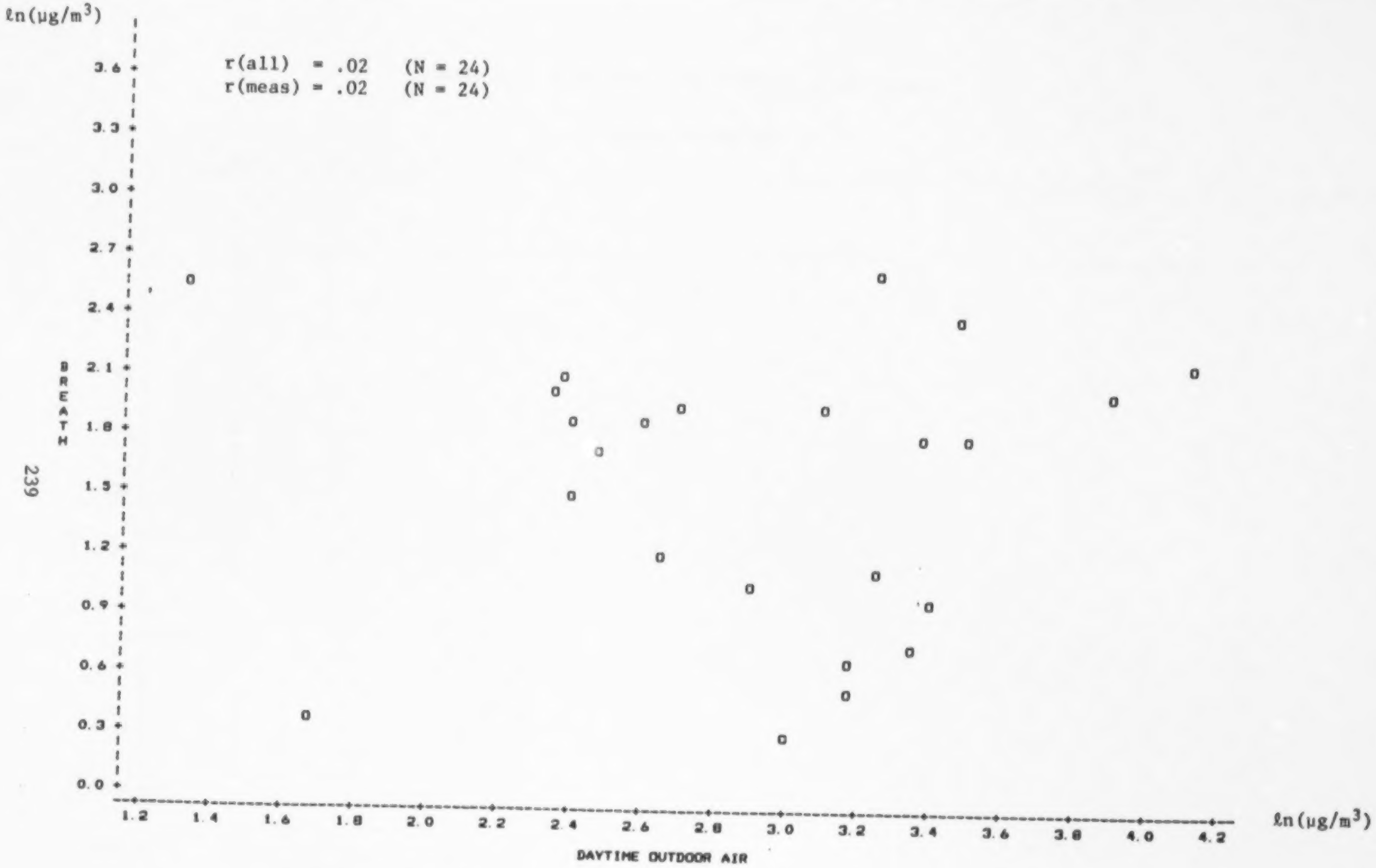


Figure 28. m,p-Xylene - Los Angeles first season.

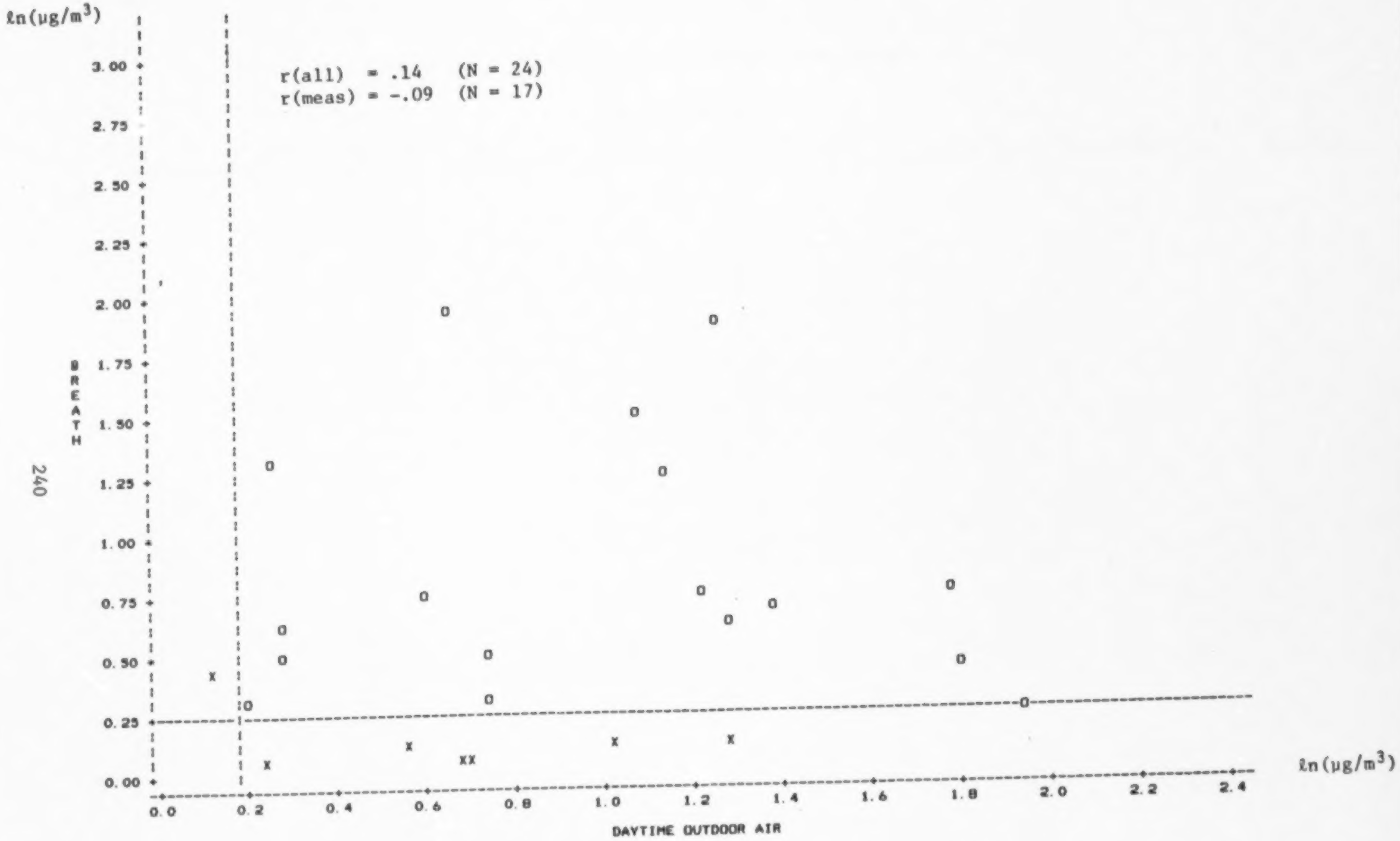


Figure 29. n-Decane - Los Angeles first season.

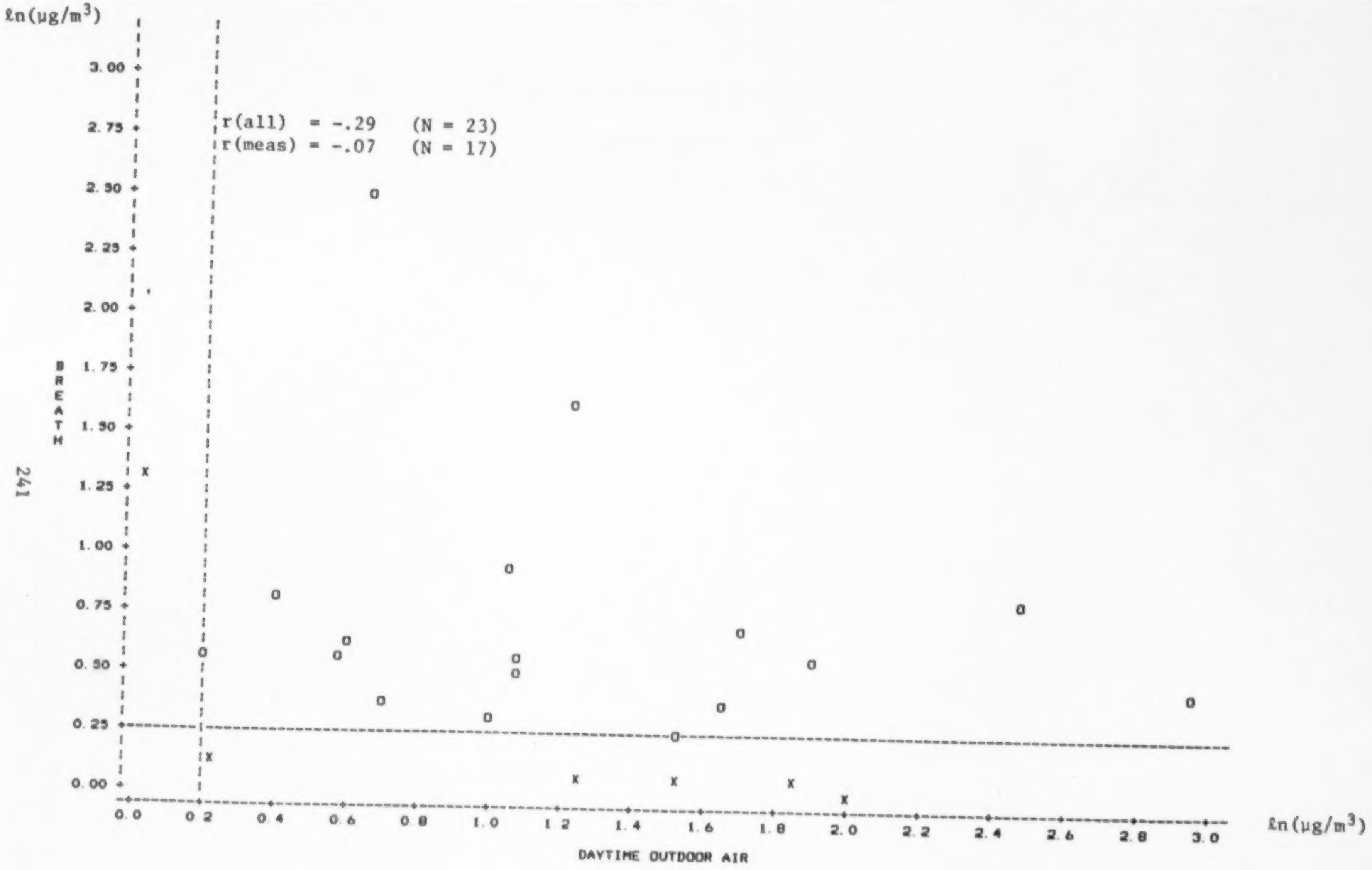


Figure 30. n-Octane - Los Angeles first season.

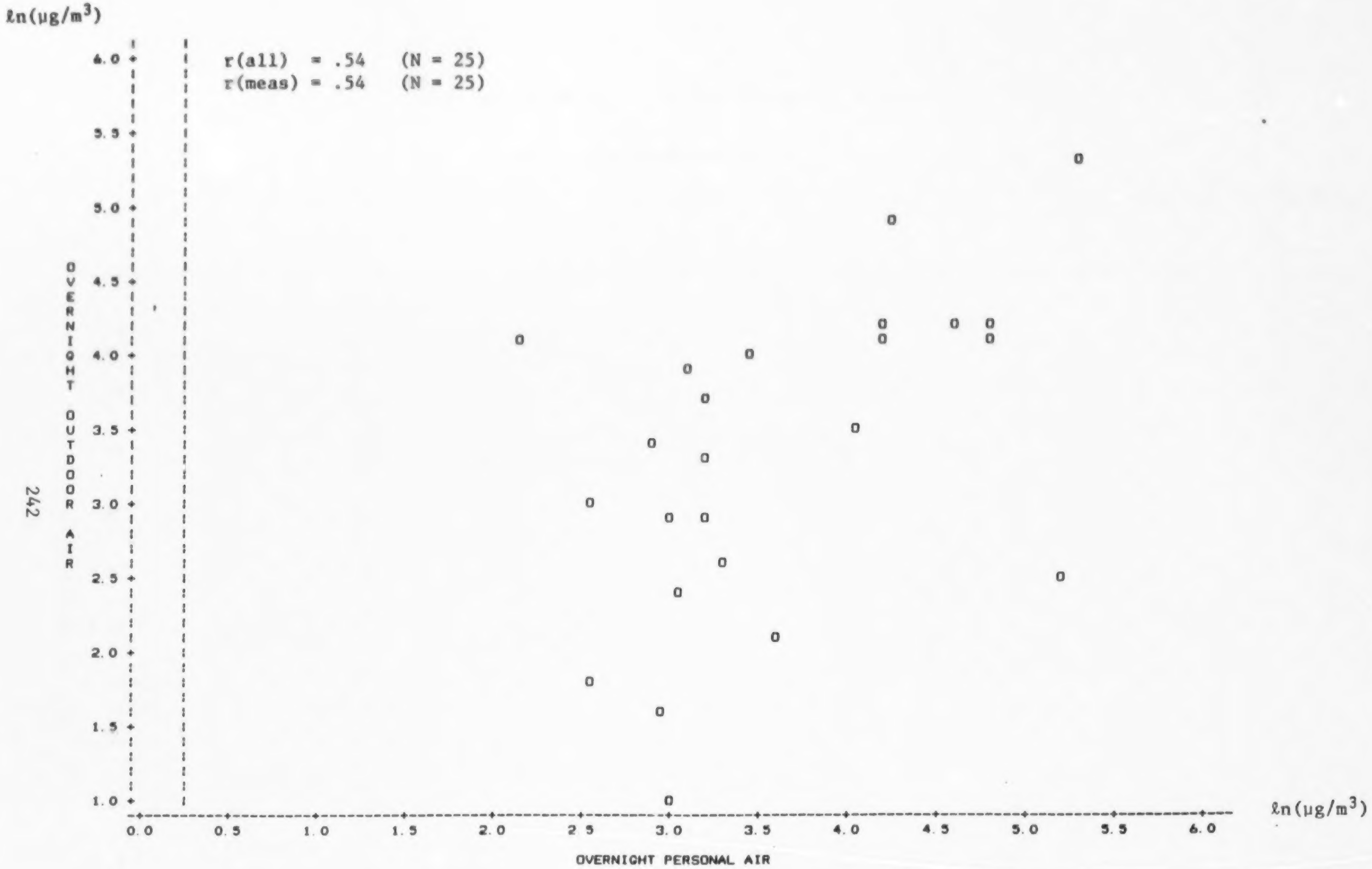


Figure 31. 1,1,1-Trichloroethane - Los Angeles first season.

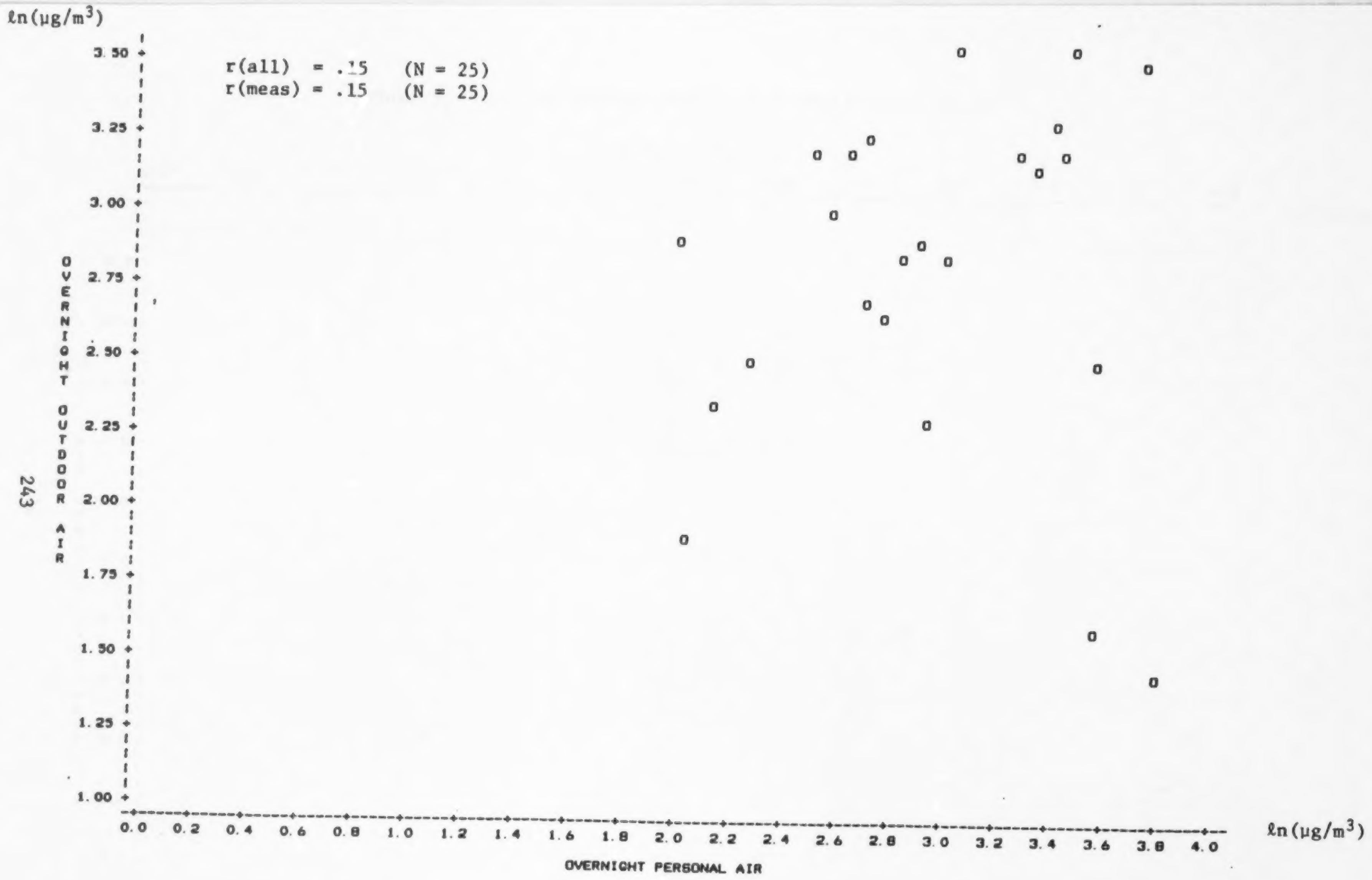


Figure 32. Benzene - Los Angeles first season.

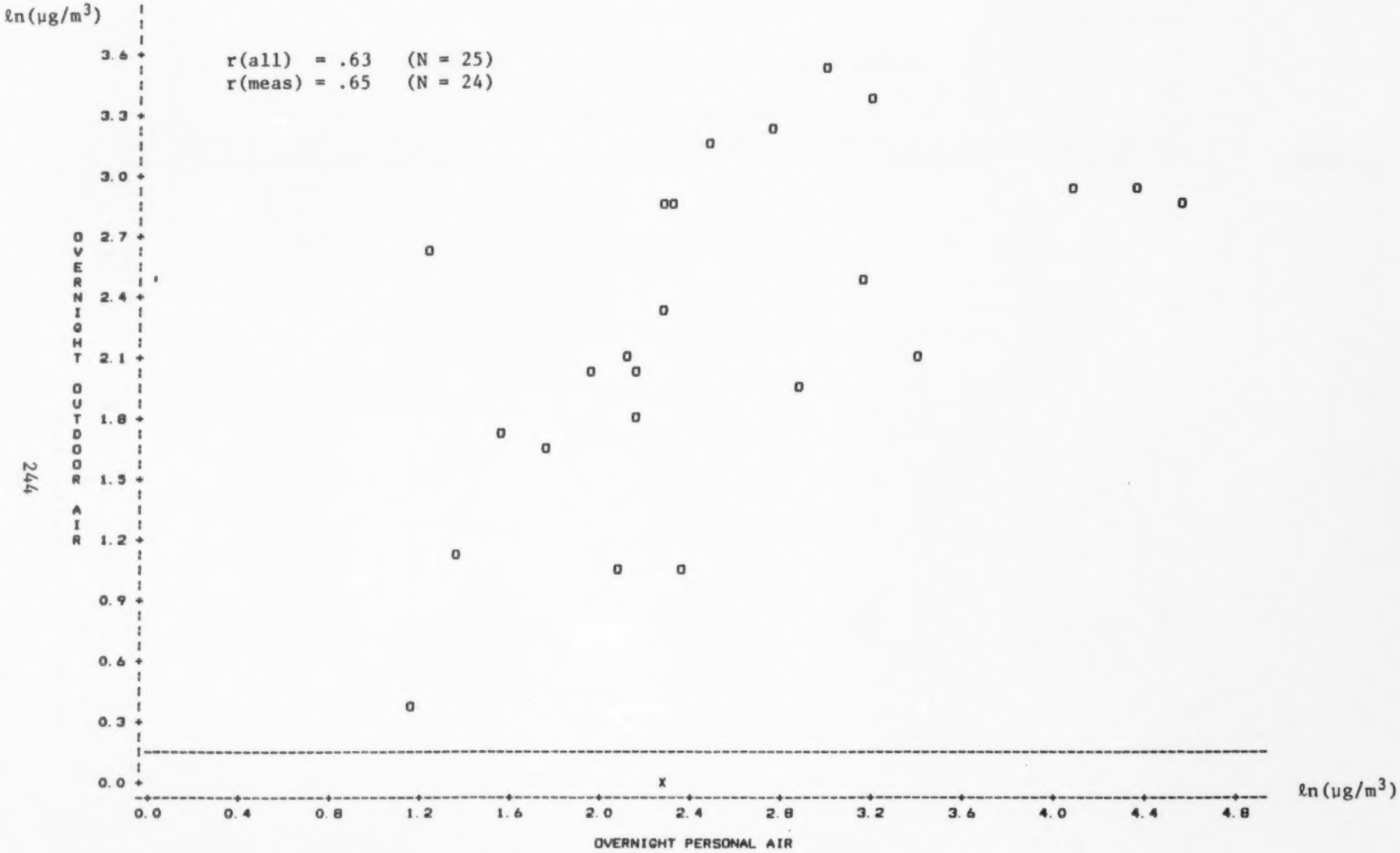


Figure 33. Tetrachloroethylene - Los Angeles first season.

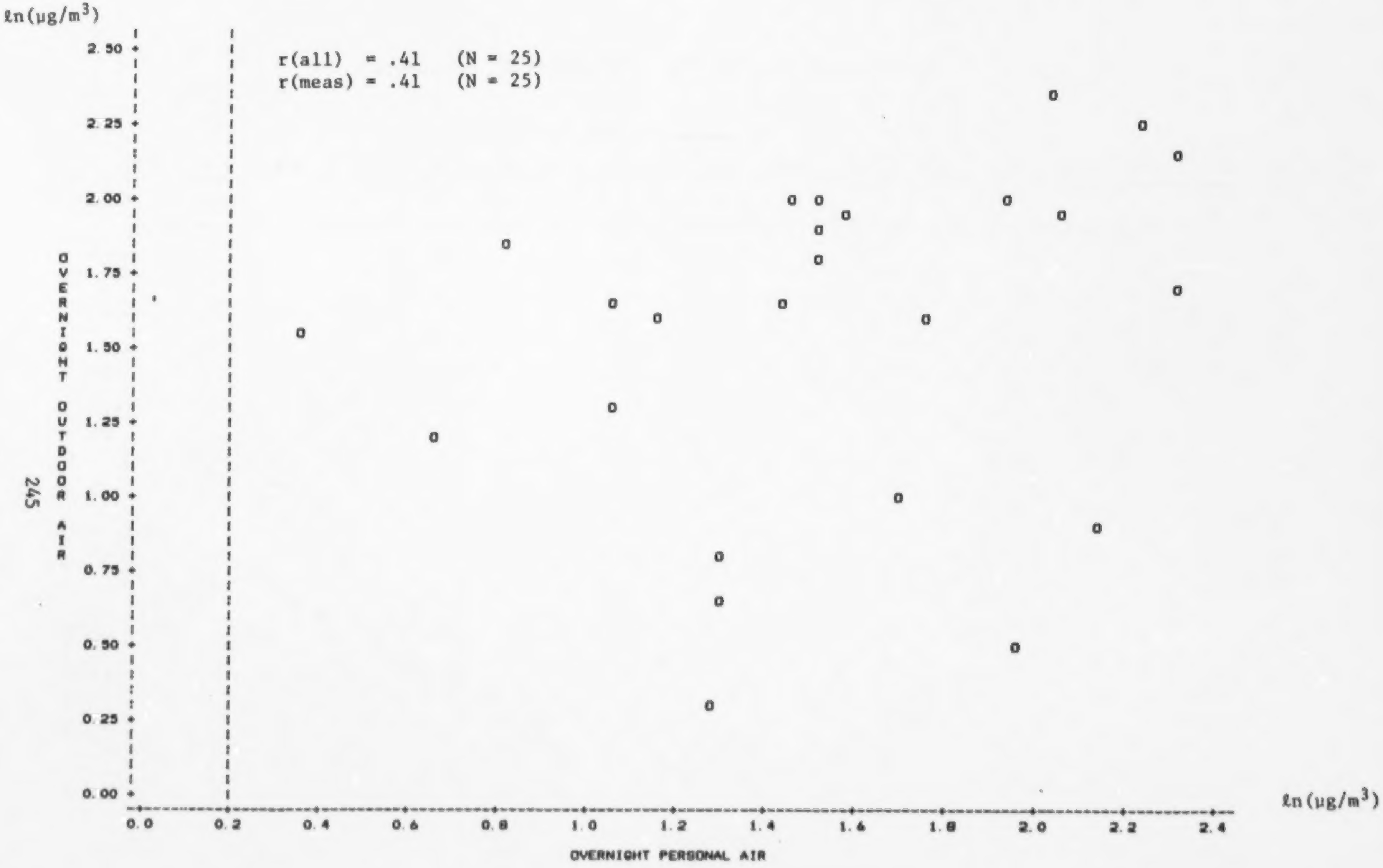


Figure 34. Styrene - Los Angeles first season.

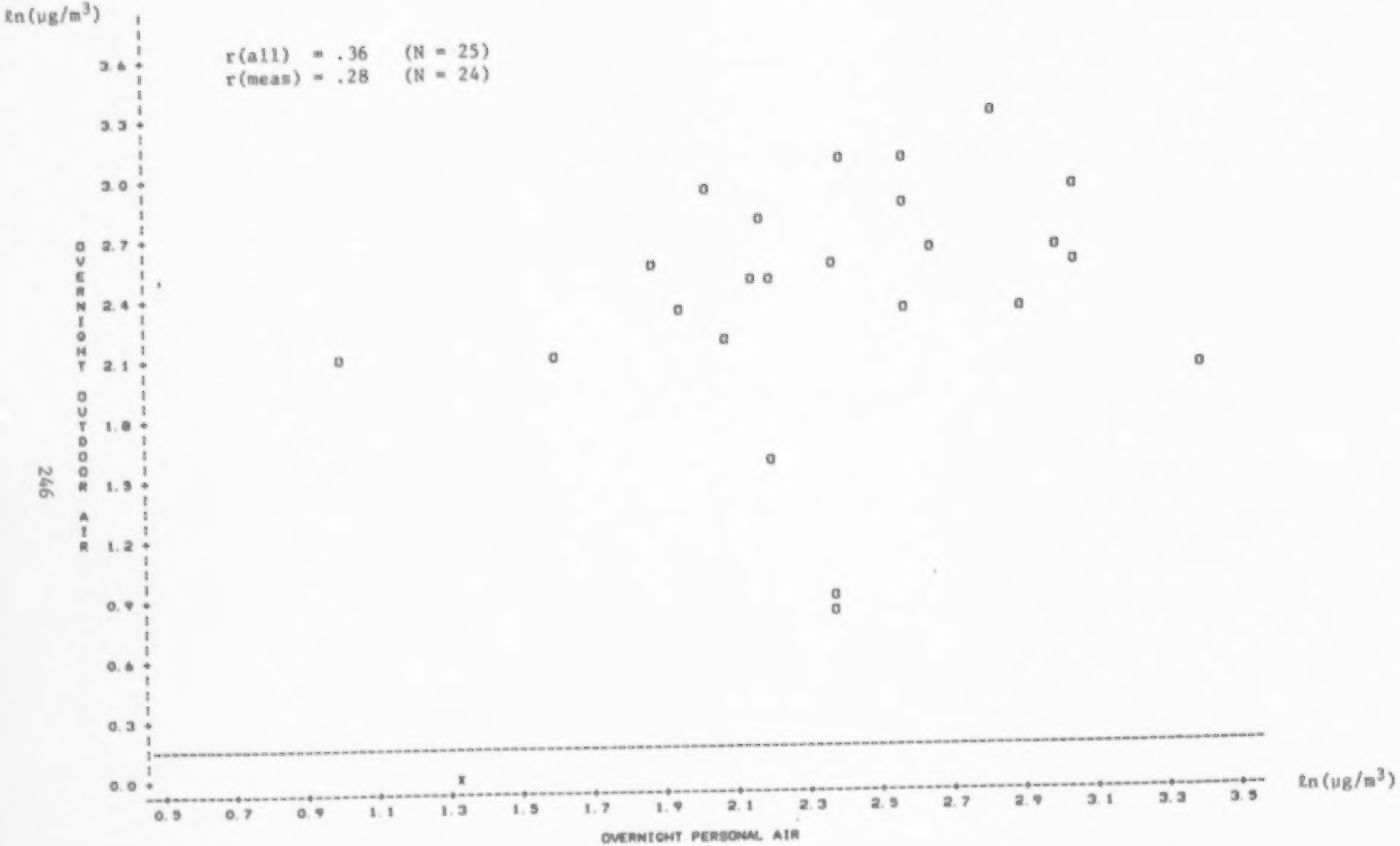


Figure 35. Ethylbenzene - Los Angeles first season.

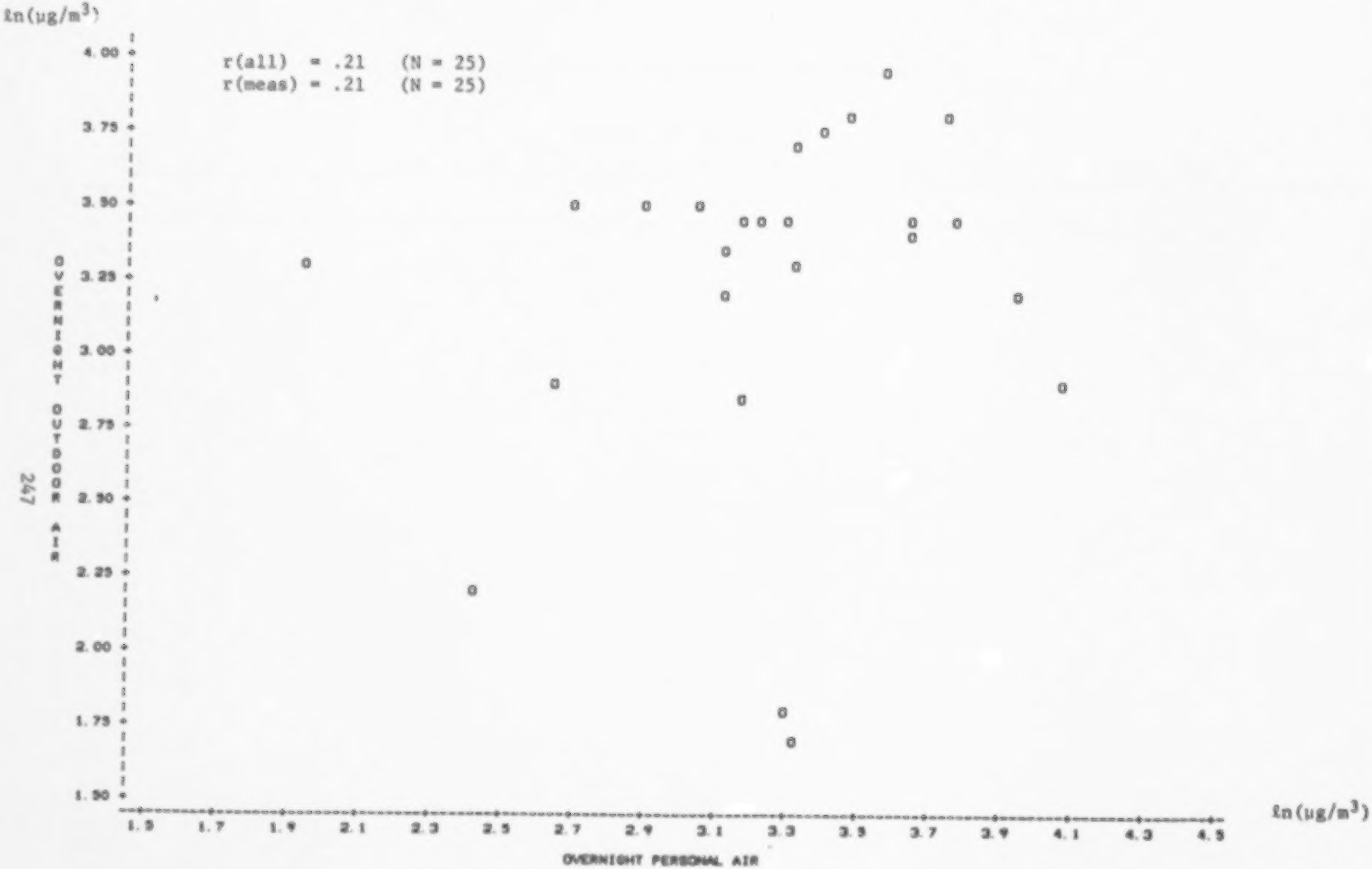


Figure 36. m,p-Xylene - Los Angeles first season.

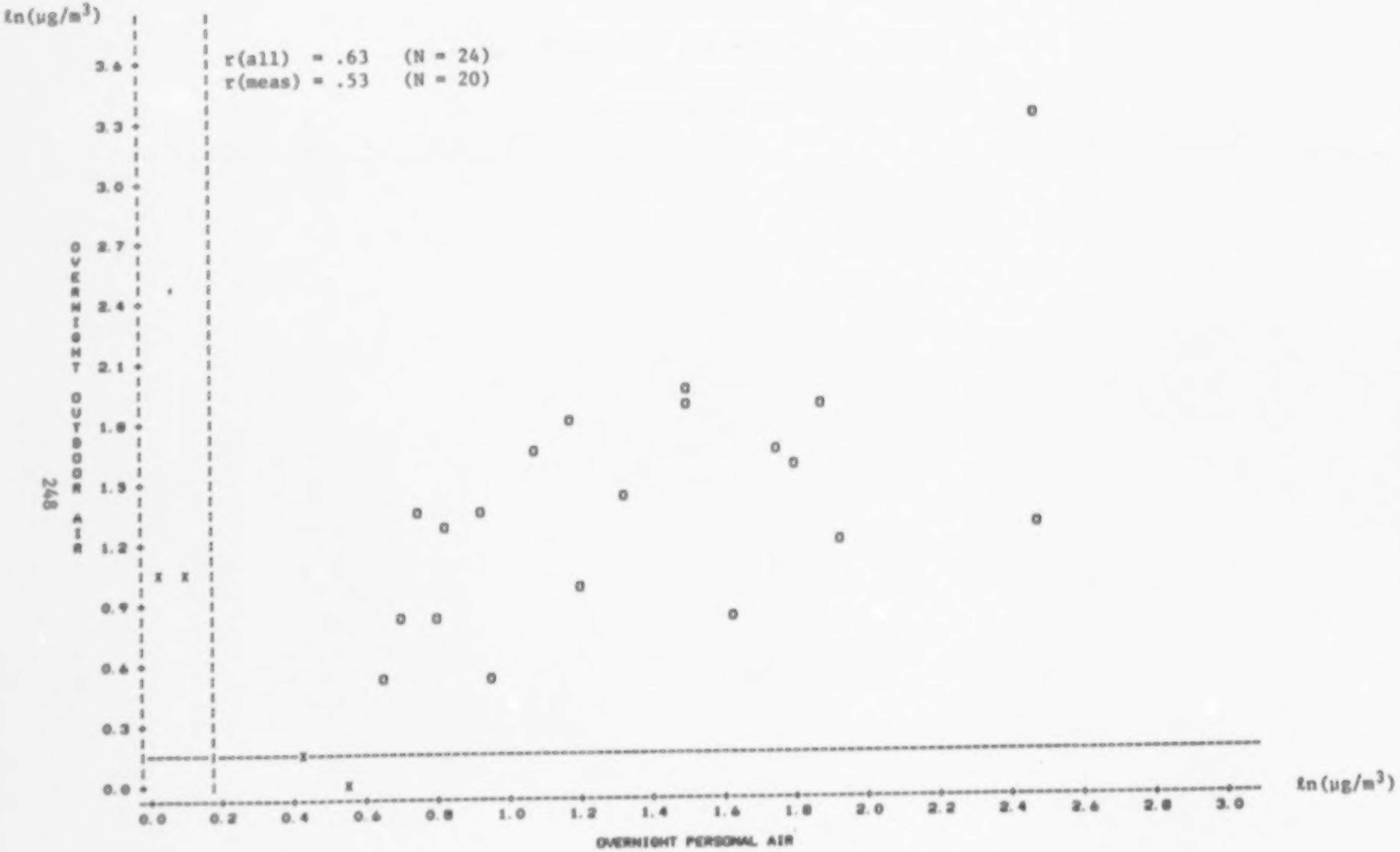


Figure 37. n-Decane - Los Angeles first season.

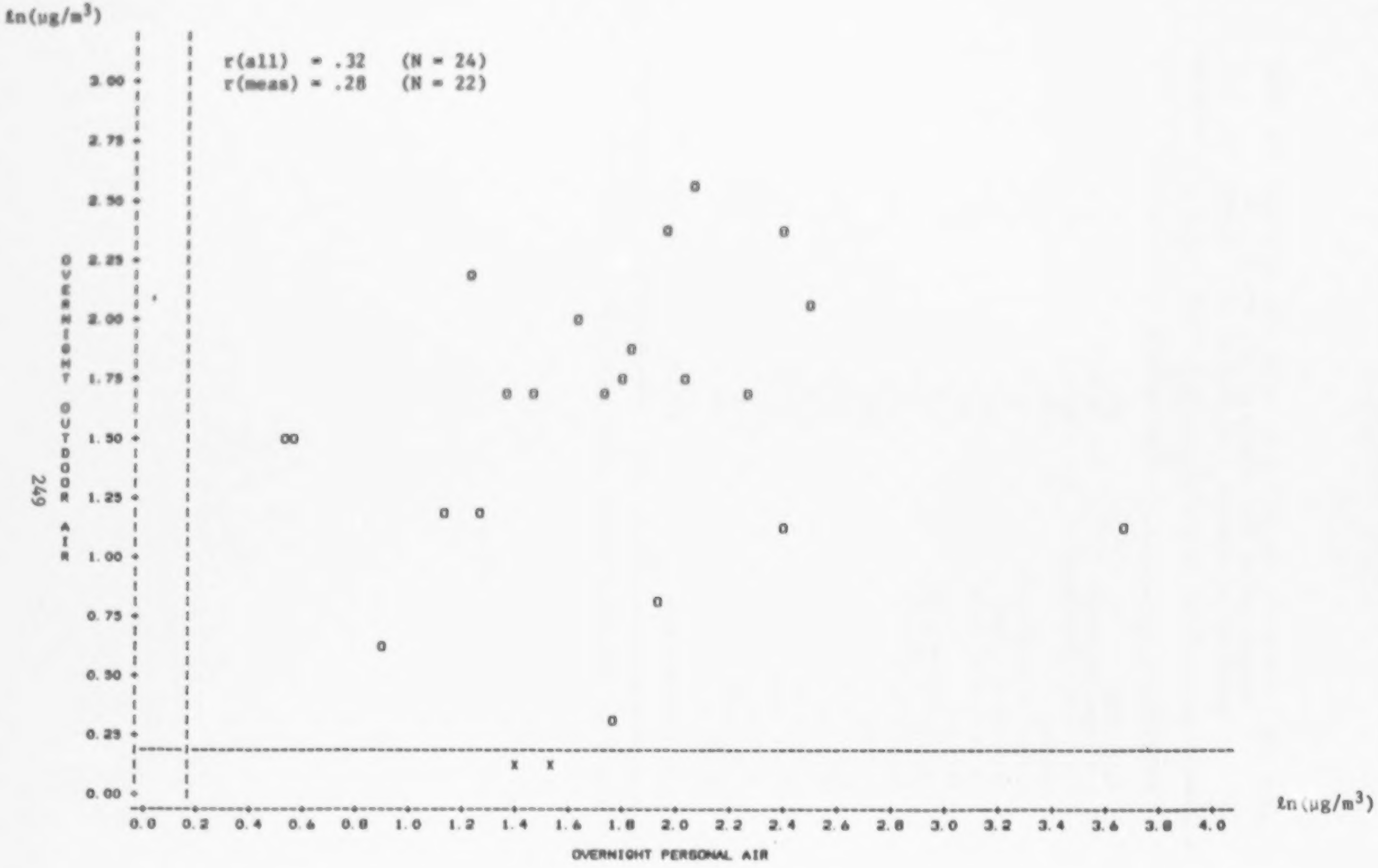


Figure 38. n-Octane - Los Angeles first season.

TABLE 113. UNWEIGHTED PERCENT OF CONCENTRATIONS MEASURABLE FOR THOSE PERSONS HAVING BOTH OVERNIGHT PERSONAL AIR AND OVERNIGHT OUTDOOR AIR - LOS ANGELES FIRST SEASON

Compound	Overnight Personal Air	Overnight Outdoor Air
Chloroform	100.	91.7
1,2-Dichloroethane	64.0	54.2
1,1,1-Trichloroethane	100.	100.
Benzene	100.	100.
Carbon Tetrachloride	96.0	95.8
Trichloroethylene	91.7	95.8
Tetrachloroethylene	100.	96.0
Styrene	100.	100.
m,p-Dichlorobenzene	100.	100.
o-Dichlorobenzene	28.0	54.2
Ethylbenzene	100.	96.0
o-Xylene	100.	100.
m,p-Xylene	100.	100.
n-Decane	88.0	91.7
n-Dodecane	100.	91.7
1,4-Dioxane	64.0	66.7
n-Octane	100.	91.7
n-Undecane	100.	96.0
a-Pinene	100.	91.7
Sample Size Range:	24-25	24-25

* T-test for difference between media significant at .05 level.

TABLE 114. UNWEIGHTED SUMMARY STATISTICS ($\mu g/m^3$) FOR THOSE PERSONS HAVING BOTH OVERNIGHT PERSONAL AIR AND OVERNIGHT OUTDOOR AIR -- LOS ANGELES FIRST SEASON

	Overnight Personal Air				Overnight Outdoor Air			
Compound	Mean	S.E.	Median	Range	Mean	S.E.	Median	Range
Chloroform	2.20*	0.32	1.60**	0.25 - 6.10	0.95	0.24	0.65	0.03 - 5.90
1,2-Dichloroethane	0.33	0.06	0.22	0.02 - 1.30	0.24	0.06	0.21	0.02 - 1.30
1,1,1-Trichloroethane	52.3	10.6	24.0	7.50 - 200.	42.7	8.71	29.0	1.70 - 190.
Benzene	20.8	2.14	18.0	6.40 - 43.0	18.1	1.73	17.0	3.20 - 33.0
Carbon Tetrachloride	0.77	0.10	0.64	0.14 - 2.60	0.71	0.07	0.65	0.13 - 1.50
Trichloroethylene	3.50	2.05	1.21**	0.02 - 50.0	0.93	0.15	0.69	0.13 - 3.00
Tetrachloroethylene	18.5	4.68	8.90	2.20 - 94.0	11.2	1.83	7.35	0.02 - 34.0
Styrene	4.27	0.51	3.60	0.44 - 9.10	4.33	0.49	4.20	0.33 - 9.30
m,p-Dichlorobenzene	18.0	9.69	2.80**	0.61 - 214.	3.13	0.86	1.80	0.28 - 21.0
o-Dichlorobenzene	0.24	0.10	0.12	0.02 - 2.50	0.22	0.03	0.20**	0.03 - 0.55
Ethylbenzene	11.0	1.26	9.70	1.70 - 29.0	11.3	1.27	11.0	0.02 - 26.0
o-Xylene	12.8	1.37	11.0	2.00 - 34.0	12.2	1.29	11.0	1.50 - 28.0
m,p-Xylene	27.6	2.45	26.1	6.00 - 58.0	27.6	2.36	30.0	4.50 - 52.0
n-Decane	2.95	0.60	1.90	0.02 - 11.0	3.68	1.07	2.55	0.02 - 27.0
n-Dodecane	2.57*	0.50	1.40**	0.25 - 9.80	0.82	0.15	0.67	0.11 - 3.70
1,4-Dioxane	0.70	0.21	0.26	0.02 - 3.60	0.52	0.19	0.27	0.02 - 4.60
n-Octane	6.18	1.44	4.60	0.73 - 38.0	4.34	0.66	4.30	0.11 - 12.0
n-Undecane	3.79	0.58	2.90**	0.25 - 11.0	2.64	0.73	1.95	0.13 - 19.0
a-Pinene	6.15*	1.89	3.40**	0.75 - 44.0	1.30	0.25	0.82	0.02 - 4.80
Sample Size Range:			24-25				24-25	

* T-test for difference in means between media significant at .05 level.

** Wilcoxon signed rank test for difference in medians significant at .05 level.

TABLE 115. SUMMARY OF MEDIANS, MAXIMUM CONCENTRATIONS AND THEIR RATIOS FOR THOSE PERSONS HAVING OVERNIGHT PERSONAL AIR AND OVERNIGHT OUTDOOR AIR - LOS ANGELES FIRST SEASON

Compound	Overnight Personal Air	Overnight Outdoor Air	Personal/ Outdoor Ratio
Chloroform **	1.60 (6.10)*	0.65 (5.90)	2.46 (1.03)
1,2-Dichloroethane	0.22 (1.30)	0.21 (1.30)	1.05 (1.00)
1,1,1-Trichloroethane	24.0 (200.)	29.0 (190.)	0.83 (1.05)
Benzene	18.0 (43.0)	17.0 (33.0)	1.06 (1.30)
Carbon Tetrachloride	0.64 (2.60)	0.65 (1.50)	0.98 (1.73)
Trichloroethylene **	1.21 (50.0)	0.69 (3.00)	1.75 (16.7)
Tetrachloroethylene	8.90 (94.0)	7.35 (34.0)	1.21 (2.76)
Styrene	3.60 (9.10)	4.20 (9.30)	0.86 (0.98)
m,p-Dichlorobenzene **	2.80 (214.)	1.80 (21.0)	1.56 (10.2)
o-Dichlorobenzene **	0.12 (2.50)	0.20 (0.55)	0.59 (4.55)
Ethylbenzene	9.70 (29.0)	11.0 (26.0)	0.88 (1.12)
o-Xylene	11.0 (34.0)	11.0 (28.0)	1.00 (1.21)
m,p-Xylene	26.1 (58.0)	30.0 (52.0)	0.87 (1.12)
n-Decane	1.90 (11.0)	2.55 (27.0)	0.75 (0.41)
n-Dodecane **	1.40 (9.80)	0.67 (3.70)	2.08 (2.65)
1,4-Dioxane	0.26 (3.60)	0.27 (4.60)	0.95 (0.78)
n-Octane	4.60 (38.0)	4.30 (12.0)	1.07 (3.17)
n-Undecane **	2.90 (11.0)	1.95 (19.0)	1.49 (0.58)
a-Pinene **	3.40 (44.0)	0.82 (4.80)	4.15 (9.17)

* Median (Maximum)

** Wilcoxon signed rank test for difference in medians significant at .05 level.

The percents measurable are given in Table 113. For the two media the percentages appeared relatively large and similar with no significant differences between the two media as determined by a t-test at the .05 level.

The unweighted arithmetic means, standard errors, medians, and ranges for selected compounds by the two media are shown in Table 114. The means for chloroform, n-dodecane, and a-pinene were significantly higher in overnight personal air. Also, the medians for chloroform, trichloroethylene, m,p-dichlorobenzene, o-dichlorobenzene, n-dodecane, n-undecane, and a-pinene were significantly higher for overnight personal air.

Table 115 compares the median and maximum values for overnight personal air with those for overnight outdoor air. Generally, the medians appeared about the same or slightly higher for personal air as shown by the ratios, while the maximum values appeared basically higher for overnight personal air. In the case of trichloroethylene, m,p-dichlorobenzene, and a-pinene, the personal air maximum values appeared nine or more times larger.

LOS ANGELES SECOND SEASON

As a follow-up to the initial study in Los Angeles, a second study was conducted in May and June of 1984. A subsample of 52 of those who had participated in the first season study was selected representing 332,615 people.

To gain insight into possible sources of exposure, the 24-hour activity screener was again administered at the end of the 24-hour study period. Table 116 summarizes the 24-hour exposure and activity screener. As in first season, the largest number of people were exposed to smoking (42%) and tobacco (33%), service stations or garages (19%), odorous chemicals (19%), solvents (15%), and cleaning solutions (15%).

Table 117 shows the sample size ranges for each media over the twenty-eight compounds analyzed. The variation in sample size reflects the fact that not all analyses for each compound for each media could be done for each subject. Also, outdoor fixed-sites were not set up at each home but only one home per sample segment. The data file was created in the same manner as described for first season (see above).

QUANTIFIABLE LIMITS

Tables 118 through 123 give the minimum quantifiable limits (min QL), maximum quantifiable limits (max QL), the ratios of max QL to min QL (R1), the percentages of concentrations above the max QL, the percentages of concentrations measurable (above the quantifiable limit), and the ratios of percent measurable to percent above the max QL (R2). Generally, there seemed to be no large differences between the minimum and maximum quantifiable limits as reflected in the small values of their ratios. The largest differences appeared to be for _n_-dodecane in overnight and daytime outdoor air with ratios of 2.95 and 2.63, respectively. The overall small variation in quantifiable limits was also reflected in the apparently small differences between percents measurable and percents above the max QL. Some exceptions were 1,2-dibromomethane for overnight personal air, _n_-dodecane for overnight outdoor air, and _n_-dodecane and 1,1,2,2-tetrachloroethane for daytime outdoor air with R2 values of 5.55, 12.0, 3.27 and 3.68 respectively.

WEIGHTED PERCENTS MEASURABLE

Weighted percentages of concentrations measurable (above the quantifiable limit) by media and compound are given in Table 124. For

NOTES TO TABLES

1. The terms daytime outdoor air and overnight outdoor air refer to samples collected during the day and during the night from fixed-sites outside the participants' homes.
2. Bromodichloromethane, dibromochloromethane, and bromoform were not analyzed in air samples. Only chloroform, 1,1,1-trichloroethane, trichloroethylene, bromodichloromethane, dibromochloromethane, tetrachloroethylene, chlorobenzene, and bromoform were analyzed in water samples.
3. Sample size indicates the number of individual samples. The minimum and maximum sample sizes indicate that not all compounds always had a value for every individual sampled.
4. Duplicate measurements were averaged before the percentages were computed.
5. Measurable is defined as above the quantifiable limit. All concentration data is considered significant to two figures.
6. Los Angeles, second season was May and June of 1984.
7. To calculate an estimate of the 95% confidence interval for the geometric mean, the upper limit would be (geo. mean) + 1.96 (geo. s.e.) while the upper limit would be (geo. mean) - 1.96 (geo. s.e.) where geo. mean is the geometric mean and geo. s.e. is the standard error of the geometric mean.

TABLE 116. 24-HOUR SCREENER - LOS ANGELES - SECOND SEASON

1. Have You Pumped Your Own Gas In The Past 24 Hours?
   Yes = 8, No = 44

   a. During Which Monitoring Periods?
      Overnight = 3, Daytime = 5

2. Have You Done Your Own Dry Cleaning or Been In A Dry Cleaning Establishment During The Past 24 Hours?
   Yes = 2, No = 50

   a. During Which Monitoring Periods?
      Overnight = 1, Daytime = 1

3. Have You Smoked Cigarettes, Cigars, Or A Pipe In The Past 24 Hours?
   Yes = 17, No = 35

   a. During Which Monitoring Periods?
      Overnight = 1, Daytime = 6, Both = 10

4. Were You In An Enclosed Area With Active Smokers For More Than 15 Minutes At Any Time In The Past 24 Hours?
   Yes = 22, No = 30

   a. During Which Monitoring Periods?
      Overnight = 6, Daytime = 8, Both = 8

5. Have You Used Or Worked With Insecticides, Pesticides, Or Herbicides In Any Way In The Past 24 Hours?
   Yes = 5, No = 44

6. During This Time Of Year, On An Average Weekday Or Weekend Day, How Many Hours Per Day Are Spent:
   a. Away From Home: Weekday - 0-4 11
      5-9 24
      10-14 ... 14
      15-20 ... 3

      Weekend Day - 0-4 22
      5-9 15
      16-18 ... 2
      20-24 ... 3

continued

TABLE 116 (continued)

7. Have You Worked At Any Of The Following Occupations Or Been In Any Of The Following Businesses During The Past Week?

	Past Week	Past 24 Hours
Painting	5	4
Dry Cleaning	4	2
Chemical Plant	2	1
Petroleum Plant	1	
Service Station/Garage/Engine Repair	28	10
Furniture Refinishing or Repair	2	
Plastics Manufacture or Formulation	3	1
Textile Mill		
Wood Processing Plant	2	
Printing	3	2
Scientific Laboratory	7	3
Dye Plant		
Hospital	6	3
Metal Work/Smelter	2	
None of These	16	22

8. Have You Been Exposed To Any Of The Following During The Past Week?

	Past Week	Past 24 Hours
Solvents	18	8
Odorous Chemicals	24	10
Toxic or Hazardoug Chemicals	12	5
High Dust or Particulate Levels	12	5
Auto/Truck Exhaust	14	7
Cleaning Solutions	24	8
Degreasing Compounds	6	3
Other	2	2

TABLE 117. DATA AVAILABLE FOR STATISTICAL ANALYSIS BY MEDIA LOS ANGELES SECOND SEASON

Media	Sample Size Range
Breath	51
Overnight Personal Air	50-51
Daytime Personal Air	50-51
Overnight Fixed-Site Outdoor Air	23
Daytime Fixed-Site Outdoor Air	24
Water	52

TABLE 118. SUMMARY OF QUANTIFIABLE LIMITS AND PERCENTS MEASURABLE FOR BREATH SAMPLES (μg/m^3) - LOS ANGELES SECOND SEASON

Estimated Population Size: 332,615

Compound	Minimum Quantifiable Limit	Maximum Quantifiable Limit	R1 Ratio Max QL* / Min QL**	Percent Above Maximum Quantifiable Limit	Percent Measurable	R2 Ratio % Measurable / % Above Max OL*
Chloroform	0.16	0.28	1.76	31.9	32.5	1.02
1,2-Dichloroethane	0.24	0.27	1.11	2.44	2.44	1.00
1,1,1-Trichloroethane	0.34	0.44	1.29	84.6	89.2	1.05
Benzene	0.16	0.27	1.73	79.2	79.2	1.00
Carbon Tetrachloride	0.16	0.33	2.04	11.1	11.1	1.00
Trichloroethylene	0.24	0.27	1.11	44.0	44.0	1.00
Bromodichloromethane	0.16	0.27	1.73	13.2	13.8	1.05
Dibromochloromethane	0.24	0.27	1.13	3.67	3.67	1.00
Tetrachloroethylene	---	---	---	---	100.	---
Chlorobenzene	0.16	0.27	1.68	0.00	0.00	---
Bromoform	0.24	0.27	1.11	0.00	0.00	---
Styrene	0.16	0.27	1.67	34.4	36.9	1.07
m,p-Dichlorobenzene	0.22	0.54	2.44	54.9	61.3	1.12
o-Dichlorobenzene	0.16	0.27	1.68	0.00	0.00	---
Ethylbenzene	0.16	0.27	1.67	68.0	70.4	1.04
o-Xylene	0.16	0.27	1.70	57.1	57.1	1.00
m,p-Xylene	---	---	---	---	100.	---
n-Decane	0.31	0.56	1.79	24.8	24.8	1.00
n-Dodecane	0.32	0.56	1.77	16.6	16.6	1.00
1,4-Dioxane	0.16	0.27	1.68	0.00	2.94	---
1,1,1,2-Tetrachloroethane	0.24	0.27	1.11	0.00	0.00	---
1,2-Dibromoethane	0.24	0.27	1.11	0.00	0.00	---
n-Octane	0.31	0.53	1.69	56.3	60.2	1.07
n-Undecane	0.32	0.56	1.77	46.4	49.1	1.06
1,1,2,2,-Tetrachloroethane	0.24	0.27	1.11	0.00	0.61	---
a-Pinene	0.49	0.53	1.08	79.1	79.1	1.00

* Max QL = Maximum Quantifiable Limit

** Min QL = Minimum Quantifiable Limit

--- 100% measurable

TABLE 119. SUMMARY OF QUANTIFIABLE LIMITS AND PERCENTS MEASURABLE FOR OVERNIGHT PERSONAL AIR SAMPLES (µg/m^3)
LOS ANGELES SECOND SEASON

Estimated Population Size: 332,615

Compound	Minimum Quantifiable Limit	Maximum Quantifiable Limit	R1 Ratio Max QL* / Min QL**	Percent Above Maximum Quantifiable Limit	Percent Measurable	R2 Ratio % Measurable / % Above Max QL*
Chloroform	0.20	0.25	1.25	78.2	80.5	1.03
1,2-Dichloroethane	0.18	0.22	1.22	11.2	11.2	1.00
1,1,1-Trichloroethane	---	---	---	---	---	---
Benzene	0.19	0.21	1.11	98.9	98.9	1.00
Carbon Tetrachloride	0.22	0.26	1.18	98.9	98.9	1.00
Trichloroethylene	0.13	0.22	1.76	58.0	58.8	1.01
Tetrachloroethylene	0.21	0.22	1.06	98.9	98.9	1.00
Chlorobenzene	0.11	0.22	1.93	2.75	7.88	2.87
Styrene	0.18	0.22	1.22	79.9	79.9	1.00
m,p-Dichlorobenzene	0.24	0.42	1.78	72.8	87.0	1.20
o-Dichlorobenzene	0.18	0.26	1.44	15.9	18.7	1.18
Ethylbenzene	0.20	0.22	1.10	96.7	96.7	1.00
o-Xylene	0.20	0.21	1.04	97.0	97.0	1.00
m,p-Xylene	---	---	---	---	100.	---
n-Decane	0.72	0.88	1.22	53.9	62.4	1.16
n-Dodecane	0.89	1.10	1.24	26.9	29.9	1.11
1,4-Dioxane	0.18	0.22	1.22	12.3	12.3	1.00
1,1,1,2-Tetrachloroethane	0.18	0.22	1.22	2.21	4.94	2.24
1,2-Dibromomethane	0.18	0.22	1.22	0.66	3.66	5.55
n-Octane	0.56	0.66	1.17	92.4	92.4	1.00
n-Undecane	0.72	0.88	1.22	58.7	63.2	1.08
1,1,2,2,-Tetrachloroethane	0.18	0.22	1.22	10.4	10.4	1.00
a-Pinene	0.36	0.44	1.22	89.6	91.8	1.02

* Max QL = Maximum Quantifiable Limit
** Min QL = Minimum Quantifiable Limit
--- 100% measurable

TABLE 120. SUMMARY OF QUANTIFIABLE LIMITS AND PERCENTS MEASURABLE FOR DAYTIME PERSONAL AIR SAMPLES ($\mu g/m^3$)
LOS ANGELES SECOND SEASON

Estimated Population Size: 332,615

Compound	Minimum Quantifiable Limit	Maximum Quantifiable Limit	R1 Ratio Max QL* / Min QL**	Percent Above Maximum Quantifiable Limit	Percent Measurable	R2 Ratio % Measurable / % Above Max QL*
Chloroform	0.15	0.28	1.86	53.4	59.1	1.11
1,2-Dichloroethane	0.12	0.22	1.80	20.4	22.6	1.11
1,1,1-Trichloroethane	---	---	---	---	100.	---
Benzene	---	---	---	---	100.	---
Carbon Tetrachloride	0.22	0.22	1.00	99.5	99.5	1.00
Trichloroethylene	0.11	0.22	1.97	66.0	66.0	1.00
Tetrachloroethylene	0.20	0.20	1.00	99.5	99.5	1.00
Chlorobenzene	0.11	0.22	2.07	4.20	4.78	1.14
Styrene	0.17	0.22	1.28	85.1	85.1	1.00
m,p-Dichlorobenzene	0.25	0.44	1.77	72.2	82.8	1.15
o-Dichlorobenzene	0.17	0.22	1.32	6.56	6.56	1.00
Ethylbenzene	0.21	0.22	1.05	97.3	97.3	1.00
o-Xylene	0.20	0.22	1.10	96.3	96.3	1.00
m,p-Xylene	---	---	---	---	100.0	---
n-Decane	0.70	0.89	1.27	74.4	81.4	1.09
n-Dodecane	0.88	1.12	1.27	41.0	45.0	1.10
1,4-Dioxane	0.17	0.22	1.32	19.3	19.3	1.00
1,1,1,2-Tetrachloroethane	0.17	0.22	1.32	4.20	4.20	1.00
1,2-Dibromomethane	0.17	0.22	1.30	0.00	0.00	---
n-Octane	0.52	0.62	1.19	93.5	93.5	1.00
n-Undecane	0.70	0.89	1.27	68.7	74.1	1.08
1,1,2,2,-Tetrachloroethane	0.11	0.22	2.07	15.6	15.6	1.00
a-Pinene	0.36	0.44	1.21	80.5	85.6	1.06

* Max QL = Maximum Quantifiable Limit
** Min QL = Minimum Quantifiable Limit
--- 100% measurable

TABLE 121. SUMMARY OF QUANTIFIABLE LIMITS AND PERCENTS MEASURABLE FOR OVERNIGHT OUTDOOR AIR SAMPLES ($\mu g/m^3$) LOS ANGELES SECOND SEASON

Estimated Population Size: 332,615

Compound	Minimum Quantifiable Limit	Maximum Quantifiable Limit	R1 Ratio Max QL* / Min QL**	Percent Above Maximum Quantifiable Limit	Percent Measurable	R2 Ratio % Measurable / % Above Max QL*
Chloroform	0.11	0.26	2.27	30.9	30.9	1.00
1,2-Dichloroethane	0.11	0.22	1.96	0.00	0.00	---
1,1,1-Trichloroethane	---	---	---	---	100.	---
Benzene	---	---	---	---	100.	---
Carbon Tetrachloride	---	---	---	---	100.	---
Trichloroethylene	0.17	0.22	1.32	6.08	13.8	2.27
Tetrachloroethylene	---	---	---	---	100.	1.00
Chlorobenzene	0.11	0.22	1.96	0.00	0.00	---
Styrene	0.11	0.19	1.67	83.7	83.7	1.00
m,p-Dichlorobenzene	0.24	0.39	1.66	66.2	77.3	1.17
o-Dichlorobenzene	0.11	0.22	1.96	17.6	17.6	1.00
Ethylbenzene	---	---	---	---	100.	---
o-Xylene	---	---	---	---	100.	---
m,p-Xylene	---	---	---	---	100.	---
n-Decane	0.68	0.88	1.29	24.1	44.5	1.85
n-Dodecane	0.38	1.12	2.95	2.60	31.1	12.0
1,4-Dioxane	0.17	0.22	1.30	18.1	21.1	1.17
1,1,1,2-Tetrachloroethane	0.17	0.22	1.30	4.69	12.4	2.64
1,2-Dibromomethane	0.17	0.22	1.30	5.22	12.9	2.47
n-Octane	0.35	0.60	1.73	60.8	67.2	1.11
n-Undecane	0.47	0.82	1.76	36.2	48.0	1.33
1,1,2,2,-Tetrachloroethane	0.17	0.22	1.30	17.6	17.6	1.00
a-Pinene	0.34	0.44	1.29	31.0	46.7	1.51

* Max QL = Maximum Quantifiable Limit
** Min QL = Minimum Quantifiable Limit
--- 100% measurable

TABLE 122. SUMMARY OF QUANTIFIABLE LIMITS AND PERCENTS MEASURABLE FOR DAYTIME OUTDOOR AIR SAMPLES ($\mu g/m^3$)
LOS ANGELES SECOND SEASON

Estimated Population Size: 332,615

Compound	Minimum Quantifiable Limit	Maximum Quantifiable Limit	R1 Ratio Max QL* / Min QL**	Percent Above Maximum Quantifiable Limit	Percent Measurable	R2 Ratio % Measurable / % Above Max QL*
Chloroform	0.20	0.26	1.33	28.1	31.4	1.12
1,2-Dichloroethane	0.17	0.22	1.30	0.00	4.63	---
1,1,1-Trichloroethane	---	---	---	---	100.	---
Benzene	---	---	---	---	100.	---
Carbon Tetrachloride	---	---	---	---	100.	---
Trichloroethylene	0.13	0.22	1.72	4.41	4.41	1.00
Tetrachloroethylene	---	---	---	---	100.	---
Chlorobenzene	0.13	0.22	1.69	0.00	0.00	---
Styrene	0.20	0.20	1.00	93.5	94.2	1.01
m,p-Dichlorobenzene	0.21	0.27	1.29	71.2	71.2	1.00
o-Dichlorobenzene	0.12	0.22	1.83	8.35	8.35	1.00
Ethylbenzene	---	---	---	---	100.	---
o-Xylene	---	---	---	---	100.	---
m,p-Xylene	---	---	---	---	100.	---
n-Decane	0.43	0.82	1.91	33.6	46.4	1.38
n-Dodecane	0.38	1.00	2.63	11.7	38.3	3.27
1,4-Dioxane	0.17	0.22	1.30	9.73	17.4	1.79
1,1,1,2-Tetrachloroethane	0.17	0.22	1.30	0.00	3.06	---
1,2-Dibromomethane	0.17	0.22	1.30	0.00	0.00	---
n-Octane	0.33	0.62	1.88	39.1	59.3	1.52
n-Undecane	0.44	0.82	1.86	28.9	50.7	1.75
1,1,2,2,-Tetrachloroethane	0.17	0.22	1.30	2.85	10.5	3.68
a-Pinene	0.34	0.44	1.29	49.6	57.2	1.15

* Max QL = Maximum Quantifiable Limit
** Min QL = Minimum Quantifiable Limit
--- 100% measurable

TABLE 123. SUMMARY OF QUANTIFIABLE LIMITS AND PERCENTS MEASURABLE FOR WATER SAMPLES (ng/mL) - LOS ANGELES SECOND SEASON

Estimated Population Size: 332,615

Compound	Minimum Quantifiable Limit	Maximum Quantifiable Limit	R1 Ratio Max QL* / Min QL**	Percent Above Maximum Quantifiable Limit	Percent Measurable	R2 Ratio % Measurable / % Above Max QL*
Chloroform	1.50	1.50	1.00	85.0	85.6	1.01
1,1,1-Trichloroethane	0.05	0.08	1.50	13.6	13.6	1.00
Trichloroethylene	0.05	0.05	1.00	12.0	12.0	1.00
Bromodichloromethane	0.30	0.30	1.00	92.5	95.6	1.03
Dibromochloromethane	0.30	0.30	1.00	85.0	85.0	1.00
Tetrachloroethylene	0.05	0.05	1.00	14.1	18.7	1.33
Chlorobenzene	0.05	0.08	1.50	4.71	4.71	1.00
Bromoform	0.30	0.30	1.00	89.5	89.5	1.00

* Max QL = Maximum Quantifiable Limit
** Min QL = Minimum Quantifiable Limit

TABLE 124. WEIGHTED PERCENT MEASURABLE BY MEDIA - LOS ANGELES SECOND SEASON

Estimated Population Size: 332,615

Compound	Breath	Overnight Personal Air	Daytime Personal Air	Overnight Outdoor Air	Daytime Outdoor Air	Water
Chloroform	32.5	80.5	59.1	30.9	31.4	85.6
1,2-Dichloroethane	2.44	11.2	22.6	0.00	4.63	---
1,1,1-Trichloroethane	89.2	100.	100.	100.	100.	13.6
Benzene	79.2	98.9	100.	100.	100.	---
Carbon Tetrachloride	11.1	98.9	99.5	100.	100.	---
Trichloroethylene	44.0	58.8	66.0	13.8	4.41	12.0
Bromodichloromethane	13.8	---	---	---	---	95.6
Dibromochloromethane	3.67	---	---	---	---	85.0
Tetrachloroethylene	100.	98.9	99.5	100.	100.	18.7
Chlorobenzene	0.00	7.88	4.78	0.00	0.00	4.71
Bromoform	0.00	---	---	---	---	89.5
Styrene	36.9	79.9	85.1	83.7	94.2	---
m,p-Dichlorobenzene	61.3	87.0	82.8	77.3	71.2	---
o-Dichlorobenzene	0.00	18.7	6.56	17.6	8.35	---
Ethylbenzene	70.4	96.7	97.3	100.	100.	---
o-Xylene	57.1	97.0	96.3	100.	100.	---
m,p-Xylene	100.	100.	100.	100.	100.	---
n-Decane	24.8	62.4	81.4	44.5	46.4	---
n-Dodecane	16.6	29.9	45.0	31.1	38.3	---
1,4-Dioxane	2.94	12.3	19.3	21.1	17.4	---
1,1,1,2-Tetrachloroethane	0.00	4.94	4.20	12.4	3.06	---
1,2-Dibromoethane	0.00	3.66	0.00	12.9	0.00	---
n-Octane	60.2	92.4	93.5	67.2	59.3	---
n-Undecane	49.1	63.2	74.1	48.0	50.7	---
1,1,2,2,-Tetrachloroethane	0.61	10.4	15.6	17.6	10.5	---
a-Pinene	79.1	91.8	85.6	46.7	57.2	---
Sample Size Range:	51	50-51	50-51	23	24	52

--- Not analyzed in this media.

breath and air tetrachloroethylene and m,p-xylene were 98.9% or higher measurable. In air, 1,1,1-trichloroethane, benzene, carbon tetrachloride, ethylbenzene, and o-xylene, were 96% or more measurable while breath ranged from 11% to 89% measurable. For chlorobenzene, o-dichlorobenzene, 1,1,1,2-tetrachloroethane, 1,2-dibromoethane, and 1,1,2,2-tetrachloroethane breath and air were less than 20% measurable. For water, chloroform, bromodichloromethane, dibromochloromethane, and bromoform were at least 85% measurable.

WEIGHTED SUMMARY STATISTICS

Weighted summary statistics for those compounds selected in first season are given in Tables 125 through 130. The statistics given are median quantifiable limit, arithmetic mean, arithmetic standard error, geometric mean, geometric standard error, median, percentiles, and range.

As in first season, the arithmetic means appeared almost always larger than the geometric means and medians. This could be in part caused by large outliers. These outliers can be observed by comparing the 95th percentile to the maximum value. Compounds with apparently large values were 1,1,1-trichloroethane, benzene, and tetrachloroethylene for breath; 1,1,1-trichloroethane, benzene, m,p-dichlorobenzene, and m,p-xylene for overnight personal air; 1,1,1-trichloroethane, benzene, trichloroethylene, tetrachloroethylene, m,p-dichlorobenzene, and m,p-xylene for daytime personal air; and for overnight and daytime outdoor air 1,1,1-trichloroethane and m,p-xylene. For water, chloroform, bromodichloromethane, and dibromochloromethane showed relatively high values.

The medians for breath, daytime personal air, and daytime outdoor air are compared in Table 131. As shown by their ratios, the medians for daytime personal air were about the same or larger than those for daytime outdoor air. The ratios for chloroform and trichloroethylene seemed particularly large. In comparing the medians for daytime outdoor air to those for breath, the ratios showed a range of .18 to 6.40. For some compounds such as trichloroethylene, tetrachloroethylene, and a-pinene, the median for breath was more than twice as large as that for daytime outdoor air; while for carbon tetrachloride, styrene, ethylben-

TABLE 125. WEIGHTED SUMMARY STATISTICS FOR SELECTED COMPOUNDS FOR BREATH ($\mu g/m^3$) - LOS ANGELES SECOND SEASON

Estimated Population Size: 332,615
Sample Size Range: 51

	a/ Mid. Q.L.	Arith. Mean	b/ Arith. S.E.	c/ Geo. Mean	d/ Geo. S.E.	Percentiles 16	25	Med.	75	84	90	95	Range
Chloroform	0.27	0.81	0.27	0.14	0.04	0.03	0.03	0.03	0.60	1.90	2.70	4.70	0.03 - 7.80
1,2-Dichloroethane	0.27	0.05	0.01	0.04	0.00	0.03	0.03	0.03	0.03	0.03	0.03	0.17	0.03 - 0.44
1,1,1-Trichloroethane	0.37	22.7	10.0	3.01	0.79	0.50	0.62	3.75	9.90	17.0	27.0	150.	0.04 - 280.
Benzene	0.27	8.82	1.29	2.29	0.82	0.03	0.69	4.20	8.81	19.0	24.0	36.0	0.03 - 85.0
Carbon Tetrachloride	0.27	0.24	0.12	0.09	0.02	0.03	0.03	0.10	0.17	0.18	0.36	0.54	0.03 - 3.20
Trichloroethylene	0.27	0.95	0.29	0.19	0.05	0.03	0.03	0.17	1.00	1.20	2.20	3.70	0.03 - 35.0
Tetrachloroethylene	e/	9.14	2.76	4.40	0.81	1.60	2.60	4.00	5.50	13.0	23.5	38.0	0.44 - 81.0
Styrene	0.27	0.87	0.35	0.17	0.05	0.03	0.03	0.16	0.76	1.50	1.90	3.20	0.03 - 13.0
m,p-Dichlorobenzene	0.54	2.90	1.13	0.69	0.19	0.21	0.21	0.60	1.67	2.27	4.37	21.3	0.07 - 35.8
o-Dichlorobenzene	0.27	0.04	0.00	0.04	0.00	0.03	0.03	0.03	0.03	0.03	0.03	0.10	0.03 - 0.17
Ethylbenzene	0.27	1.06	0.15	0.55	0.08	0.17	0.17	0.54	1.20	2.70	3.50	3.60	0.10 - 11.0
o-Xylene	0.27	0.73	0.08	0.41	0.07	0.17	0.17	0.46	1.20	1.60	1.60	1.80	0.03 - 3.70
m,p-Xylene	e/	2.76	0.28	1.81	0.21	0.81	0.88	1.40	4.30	5.90	6.30	7.75	0.40 - 18.0
n-Decane	0.53	0.51	0.15	0.26	0.02	0.07	0.07	0.33	0.34	0.70	0.70	1.10	0.07 - 25.0
n-Dodecane	0.53	0.36	0.05	0.24	0.04	0.07	0.07	0.33	0.33	0.59	0.69	0.77	0.06 - 3.40
1,4-Dioxane	0.27	0.05	0.01	0.04	0.00	0.03	0.03	0.03	0.03	0.07	0.17	0.17	0.03 - 0.17
n-Octane	0.53	1.15	0.25	0.65	0.06	0.33	0.33	0.76	1.20	1.40	1.80	2.70	0.07 - 43.0
n-Undecane	0.52	0.67	0.16	0.29	0.05	0.07	0.07	0.33	0.77	1.10	1.30	1.70	0.06 - 23.0
a-Pinene	0.53	1.73	0.28	0.99	0.13	0.33	0.59	0.93	1.60	2.20	5.20	6.20	0.07 - 11.0

a/ Mid. Q.L. = Median Quantifiable Limit
b/ Arith. S.E. = Standard Error of Arithmetic Mean
c/ Geo. Mean = Geometric Mean
d/ Geo. S.E. = Standard Error of Geometric Mean
e/ 100% measurable

TABLE 126. WEIGHTED SUMMARY STATISTICS FOR SELECTED COMPOUNDS FOR OVERNIGHT PERSONAL AIR ($\mu g/m^3$) - LOS ANGELES SECOND SEASON

Estimated Population Size: 332,615
Sample Size Range: 50-51

	a/ Mid. Q.L.	Arith. Mean	b/ Arith. S.E.	c/ Geo. Mean	d/ Geo. S.E.	Percentiles							Range
						16	25	Med.	75	84	90	95	
Chloroform	0.22	1.57	0.48	0.59	0.16	0.14	0.28	0.67	1.40	2.40	5.20	5.30	0.03 - 20.0
1,2-Dichloroethane	0.20	0.12	0.03	0.06	0.01	0.02	0.02	0.03	0.13	0.13	0.24	0.59	0.02 - 1.05
1,1,1-Trichloroethane	e/	13.5	3.52	8.61	0.96	4.50	6.10	7.20	11.0	14.0	17.0	24.0	1.90 - 360.
Benzene	0.21	7.78	1.31	4.69	0.76	1.80	2.20	4.45	9.00	15.0	25.0	29.0	0.02 - 35.0
Carbon Tetrachloride	0.26	0.71	0.07	0.64	0.04	0.52	0.52	0.65	0.73	0.82	0.89	0.89	0.14 - 3.60
Trichloroethylene	0.20	2.02	1.08	0.28	0.09	0.03	0.08	0.34	0.88	1.80	2.50	6.40	0.02 - 170.
Tetrachloroethylene	0.22	3.99	1.58	1.98	0.36	0.79	1.20	1.90	3.30	3.60	4.20	9.75	0.03 - 56.0
Styrene	0.19	1.15	0.14	0.54	0.10	0.03	0.38	0.84	1.60	2.50	2.80	3.20	0.02 - 5.30
m,p-Dichlorobenzene	0.25	13.8	5.88	1.34	0.41	0.28	0.42	0.84	2.70	12.6	23.0	110.	0.05 - 250.
o-Dichlorobenzene	0.20	0.45	0.32	0.06	0.01	0.02	0.02	0.03	0.13	0.21	0.30	1.30	0.02 - 11.0
Ethylbenzene	0.20	6.02	1.50	3.00	0.67	1.40	1.50	2.50	4.90	11.0	23.0	26.0	0.03 - 35.0
o-Xylene	0.20	6.40	1.57	2.71	0.76	0.95	1.60	2.55	5.30	12.0	25.0	30.0	0.03 - 34.0
m,p-Xylene	e/	19.8	4.61	10.6	2.23	4.20	5.80	8.70	18.0	37.0	75.0	92.0	0.60 - 94.0
n-Decane	0.80	3.33	1.78	0.93	0.19	0.45	0.47	1.10	1.50	2.60	5.30	6.10	0.09 - 77.0
n-Dodecane	0.98	2.27	1.19	0.64	0.15	0.13	0.13	0.62	1.40	2.55	3.00	6.20	0.12 - 57.0
1,4-Dioxane	0.20	0.16	0.07	0.04	0.01	0.02	0.02	0.03	0.03	0.11	0.33	0.68	0.02 - 4.20
n-Octane	0.61	3.16	0.67	1.87	0.27	0.88	1.10	2.00	2.90	3.60	9.90	16.0	0.07 - 20.0
n-Undecane	0.77	4.51	2.26	1.16	0.21	0.46	0.50	1.20	2.30	2.40	4.10	4.70	0.10 - 76.0
a-Pinene	0.37	5.63	1.30	2.13	0.58	0.52	0.82	1.80	5.60	11.0	17.0	29.0	0.05 - 31.0

a/ Mid. Q.L. = Median Quantifiable Limit
b/ Arith. S.E. = Standard Error of Arithmetic Mean
c/ Geo. Mean = Geometric Mean
d/ Geo. S.E. = Standard Error of Geometric Mean
e/ 100% measurable

TABLE 177. WEIGHTED SUMMARY STATISTICS FOR SELECTED COMPOUNDS FOR DAYTIME PERSONAL AIR ($\mu g/m^3$) - LOS ANGELES SECOND SEASON

Estimated Population Size: 332,615
Sample Size Range: 50-51

	a/ Mid. Q.L.	Arith. Mean	b/ Arith. S.E.	c/ Geo. Mean	d/ Geo. S.E.	Percentiles							Range
						16	25	Med.	75	84	90	95	
Chloroform	0.23	0.72	0.16	0.22	0.07	0.03	0.03	0.30	1.00	1.20	1.60	3.40	0.02 - 12.0
1,2-Dichloroethane	0.20	0.12	0.02	0.06	0.01	0.02	0.02	0.03	0.13	0.27	0.30	0.32	0.02 - 0.66
1,1,1-Trichloroethane	e/	76.9	39.0	18.6	3.65	5.60	6.60	11.0	56.0	91.0	130.	150.	1.60 - 1600
Benzene	e/	10.5	1.62	6.88	0.92	2.57	3.20	7.20	12.0	19.0	25.0	34.0	1.30 - 54.0
Carbon Tetrachloride	0.22	0.90	0.24	0.69	0.06	0.51	0.55	0.67	0.77	0.87	0.96	1.10	0.03 - 9.20
Trichloroethylene	0.20	10.8	3.09	0.80	0.31	0.02	0.03	1.20	5.50	19.0	25.0	54.0	0.02 - 350.
Tetrachloroethylene	0.20	27.1	15.7	4.34	0.92	1.50	2.20	3.40	7.50	9.10	16.0	190.0	0.03 - 520.
Styrene	0.19	2.35	0.45	0.95	0.20	0.30	0.47	1.50	2.80	3.60	5.10	12.0	0.02 - 13.0
m,p-Dichlorobenzene	0.25	10.1	4.05	1.18	0.33	0.16	0.34	0.92	3.04	5.05	20.0	54.0	0.05 - 150.
o-Dichlorobenzene	0.20	0.10	0.04	0.04	0.01	0.02	0.02	0.03	0.03	0.11	0.13	0.63	0.02 - 1.40
Ethylbenzene	0.22	8.74	1.29	5.08	0.85	2.10	2.30	6.00	11.5	17.0	19.0	25.0	0.13 - 87.0
o-Xylene	0.20	8.05	1.38	3.90	0.86	1.30	1.90	4.00	11.0	14.0	20.0	31.0	0.03 - 69.0
m,p-Xylene	e/	27.9	4.38	16.9	2.82	6.50	7.80	18.0	37.0	52.0	76.0	80.0	0.55 - 190.
n-Decane	0.76	3.64	0.71	1.73	0.25	0.49	0.84	1.80	3.50	5.70	6.60	8.20	0.10 - 110.
n-Dodecane	0.99	1.93	0.65	0.84	0.13	0.14	0.59	0.69	1.60	1.70	2.80	9.20	0.11 - 28.0
1,4-Dioxane	0.20	3.50	3.33	0.06	0.02	0.02	0.02	0.03	0.03	0.37	0.61	1.50	0.02 - 130.
n-Octane	0.59	5.40	1.32	2.95	0.43	1.32	2.00	3.20	4.90	7.40	7.70	12.0	0.33 - 170.
n-Undecane	0.79	3.91	1.07	1.44	0.25	0.48	0.54	1.25	2.40	4.20	8.50	19.0	0.10 - 100.
a-Pinene	0.40	7.33	3.40	1.33	0.31	0.33	0.50	1.55	2.60	4.70	11.0	36.0	0.05 - 140.

a/ Mid. Q.L. = Median Quantifiable Limit
b/ Arith. S.E. = Standard Error of Arithmetic Mean
c/ Geo. Mean = Geometric Mean
d/ Geo. S.E. = Standard Error of Geometric Mean
e/ 100% measurable

TABLE 128. WEIGHTED SUMMARY STATISTICS FOR SELECTED COMPOUNDS FOR OVERNIGHT OUTDOOR AIR ($\mu g/m^3$) - LOS ANGELES SECOND SEASON

Estimated Population Size: 332,615
Sample Size Range: 23

	a/ Mid. Q.L.	Arith. Mean	b/ Arith. S.E.	c/ Geo. Mean	d/ Geo. S.E.	Percentiles 16	25	Med.	75	84	90	95	Range
Chloroform	0.21	0.35	0.12	0.10	0.03	0.02	0.03	0.03	0.60	0.77	1.08	1.80	0.02 - 2.40
1,2-Dichloroethane	0.19	0.05	0.01	0.04	0.01	0.02	0.02	0.03	0.07	0.12	0.12	0.14	0.02 - 0.14
1,1,1-Trichloroethane	e/	5.63	1.03	4.62	0.69	2.30	3.30	4.60	6.60	7.10	8.20	16.0	1.50 - 20.0
Benzene	e/	3.07	0.45	2.64	0.35	1.35	1.70	2.50	4.40	4.60	5.80	6.70	1.20 - 8.50
Carbon Tetrachloride	e/	0.66	0.05	0.63	0.04	0.50	0.53	0.64	0.72	0.78	0.96	1.10	0.33 - 1.10
Trichloroethylene	0.19	0.14	0.07	0.06	0.01	0.02	0.02	0.03	0.12	0.13	0.13	0.28	0.02 - 2.40
Tetrachloroethylene	e/	1.86	0.28	1.41	0.23	0.52	0.79	1.31	3.00	3.40	4.10	4.80	0.25 - 4.80
Styrene	0.18	0.75	0.16	0.50	0.11	0.12	0.24	0.57	0.82	1.30	1.30	2.30	0.07 - 3.10
m,p-Dichlorobenzene	0.24	0.78	0.15	0.53	0.11	0.15	0.28	0.50	1.29	1.65	1.65	2.05	0.05 - 2.35
o-Dichlorobenzene	0.19	0.12	0.05	0.05	0.01	0.02	0.02	0.03	0.11	0.27	0.27	0.82	0.02 - 0.82
Ethylbenzene	e/	2.65	0.58	2.04	0.29	1.35	1.40	1.80	3.00	3.90	5.00	5.90	0.63 - 13.0
o-Xylene	e/	2.51	0.33	2.10	0.29	1.14	1.40	1.90	3.90	4.60	4.80	5.40	0.59 - 6.30
m,p-Xylene	e/	7.98	1.07	6.71	0.88	3.10	4.60	7.30	11.0	13.0	15.0	18.0	2.10 - 26.0
n-Decane	0.76	0.67	0.12	0.48	0.09	0.11	0.46	0.48	0.82	1.10	1.60	2.00	0.10 - 2.00
n-Dodecane	0.95	0.52	0.10	0.35	0.07	0.12	0.13	0.56	0.62	0.74	1.00	1.10	0.12 - 3.10
1,4-Dioxane	0.19	0.19	0.09	0.05	0.02	0.02	0.02	0.02	0.03	0.32	0.76	0.76	0.02 - 2.40
n-Octane	0.42	0.75	0.13	0.51	0.14	0.08	0.26	0.71	1.20	1.40	1.40	1.50	0.07 - 1.70
n-Undecane	0.74	1.15	0.29	0.74	0.13	0.44	0.46	0.51	1.30	2.10	2.10	5.90	0.10 - 5.90
a-Pinene	0.39	0.49	0.13	0.30	0.06	0.06	0.23	0.26	0.56	0.97	1.10	2.20	0.05 - 2.20

a/ Mid. Q.L. = Median Quantifiable Limit
b/ Arith. S.E. = Standard Error of Arithmetic Mean
c/ Geo. Mean = Geometric Mean
d/ Geo. S.E. = Standard Error of Geometric Mean
e/ 100% measurable

TABLE 129. WEIGHTED SUMMARY STATISTICS FOR SELECTED COMPOUNDS FOR DAYTIME OUTDOOR AIR ($\mu g/m^3$) - LOS ANGELES SECOND SEASON

Estimated Population Size: 332,615
Sample Size Range: 24

	a/ Mid. Q.L.	Arith. Mean	b/ Arith. S.E.	c/ Geo. Mean	d/ Geo. S.E.	Percentiles							Range
						16	25	Med.	75	84	90	95	
Chloroform	0.21	0.32	0.11	0.08	0.03	0.03	0.03	0.03	0.42	1.10	1.10	1.50	0.02 - 2.40
1,2-Dichloroethane	0.19	0.07	0.01	0.05	0.01	0.02	0.02	0.03	0.12	0.13	0.13	0.14	0.02 - 0.21
1,1,1-Trichloroethane	e/	6.18	1.45	4.74	0.69	2.80	2.90	5.30	5.85	6.60	10.0	10.0	1.70 - 49.0
Benzene	e/	4.17	0.82	3.20	0.53	1.50	2.05	3.10	4.80	4.80	8.70	12.0	1.10 - 15.0
Carbon Tetrachloride	e/	0.66	0.03	0.65	0.03	0.51	0.57	0.64	0.78	0.84	0.88	0.88	0.41 - 1.00
Trichloroethylene	0.19	0.07	0.02	0.05	0.01	0.02	0.02	0.03	0.12	0.12	0.13	0.13	0.02 - 0.39
Tetrachloroethylene	e/	2.11	0.34	1.57	0.27	0.69	0.78	1.70	3.40	3.90	4.20	5.85	0.31 - 5.85
Styrene	0.20	1.02	0.28	0.63	0.14	0.21	0.33	0.63	1.20	1.34	2.80	4.70	0.03 - 4.70
m,p-Dichlorobenzene	0.24	0.88	0.31	0.43	0.09	0.15	0.17	0.40	0.59	0.88	1.02	4.55	0.13 - 9.35
o-Dichlorobenzene	0.19	0.06	0.02	0.04	0.01	0.02	0.02	0.02	0.08	0.12	0.14	0.28	0.02 - 0.28
Ethylbenzene	e/	3.48	1.01	2.25	0.35	1.19	1.60	1.90	3.00	3.40	3.40	14.0	0.89 - 34.0
o-Xylene	e/	2.95	0.58	2.24	0.31	1.14	1.30	2.25	3.30	4.00	4.70	11.0	0.79 - 17.0
m,p-Xylene	e/	10.9	3.15	7.43	1.06	4.10	5.30	6.70	10.0	12.0	12.0	50.0	3.10 - 99.0
n-Decane	0.77	0.73	0.07	0.63	0.06	0.46	0.48	0.50	0.96	1.20	1.50	1.80	0.27 - 1.80
n-Dodecane	0.96	0.90	0.34	0.45	0.08	0.12	0.24	0.51	0.63	0.96	1.40	2.60	0.12 - 13.0
1,4-Dioxane	0.19	0.12	0.06	0.04	0.01	0.02	0.02	0.02	0.03	0.13	0.13	0.65	0.02 - 1.80
n-Octane	0.43	0.74	0.14	0.55	0.09	0.23	0.36	0.50	1.20	1.20	1.60	2.00	0.21 - 3.50
n-Undecane	0.78	0.78	0.12	0.54	0.09	0.28	0.46	0.51	0.93	1.30	1.70	2.30	0.10 - 3.60
a-Pinene	0.39	0.52	0.08	0.34	0.06	0.21	0.24	0.29	0.72	0.77	1.30	1.30	0.05 - 2.30

a/ Mid. Q.L. = Median Quantifiable Limit
b/ Arith. S.E. = Standard Error of Arithmetic Mean
c/ Geo. Mean = Geometric Mean
d/ Geo. S.E. = Standard Error of Geometric Mean
e/ 100% measurable

TABLE 130. WEIGHTED SUMMARY STATISTICS FOR SELECTED COMPOUNDS FOR WATER (ng/mL) - LOS ANGELES SECOND SEASON

Estimated Population Size: 332,615
Sample Size Range: 52

	a/ Mid. Q.L.	Arith. Mean	b/ Arith. S.E.	c/ Geo. Mean	d/ Geo. S.E.	Percentiles 16	25	Med.	75	84	90	95	Range
Chloroform	1.50	28.8	3.36	18.0	3.93	8.72	9.23	33.0	42.2	45.0	46.6	49.2	0.94 - 52.0
1,1,1-Trichloroethane	0.05	0.08	0.02	0.04	0.01	0.03	0.03	0.03	0.03	0.03	0.29	0.35	0.03 - 0.90
Trichloroethylene	0.05	0.07	0.02	0.04	0.01	0.03	0.03	0.03	0.03	0.03	0.26	0.42	0.03 - 0.56
Bromodichloromethane	0.30	20.4	2.34	11.4	2.83	6.43	7.66	24.3	31.0	32.6	32.8	37.0	0.19 - 38.5
Dibromochloromethane	0.30	27.6	3.10	13.7	3.82	8.10	15.4	31.6	42.1	44.2	47.8	49.8	0.19 - 55.0
Tetrachloroethylene	0.05	0.04	0.00	0.04	0.00	0.03	0.03	0.03	0.03	0.04	0.09	0.10	0.03 - 0.11
Bromoform	0.30	8.08	2.37	2.86	0.66	0.49	2.04	2.97	5.94	7.35	13.4	53.4	0.19 - 78.4

a/ Mid. Q.L. = Median Quantifiable Limit
b/ Arith. S.E. = Standard Error of Arithmetic Mean
c/ Geo. Mean = Geometric Standard Error
d/ Geo. S.E. = Standard Error of Geometric Mean

TABLE 131. MEDIANS AND THEIR RATIOS COMPARING DAYTIME PERSONAL AIR TO DAYTIME OUTDOOR AIR AND DAYTIME OUTDOOR AIR TO BREATH - LOS ANGELES SECOND SEASON

	Medians			Ratios	
Compound	Breath	Daytime Personal Air	Daytime Outdoor Air	Personal to Outdoor	Outdoor to Breath
Chloroform	0.03	0.30	0.03	10.0	1.00
1,2-Dichloroethane	0.03	0.03	0.03	1.00	1.00
1,1,1-Trichloroethane	3.75	11.0	5.30	2.08	1.00
Benzene	4.20	7.20	3.10	2.32	1.41
Carbon Tetrachloride	0.10	0.67	0.64	1.05	0.74
Trichloroethylene	0.17	1.20	0.03	40.0	6.40
Tetrachloroethylene	4.00	3.40	1.70	2.00	0.18
Styrene	0.16	1.50	0.63	2.38	0.43
m,p-Dichlorobenzene	0.60	0.92	0.40	2.30	3.94
o-Dichlorobenzene	0.03	0.03	0.02	1.50	0.67
Ethylbenzene	0.54	6.00	1.90	3.16	0.67
o-Xylene	0.46	4.00	2.25	1.78	3.52
m,p-Xylene	1.40	18.0	6.70	2.69	4.89
n-Decane	0.33	1.80	0.50	3.60	4.79
n-Dodecane	0.33	0.69	0.51	1.35	1.52
1,4-Dioxane	0.03	0.03	0.02	1.50	1.55
n-Octane	0.76	3.20	0.50	6.40	0.67
n-Undecane	0.33	1.25	0.51	2.45	0.66
a-Pinene	0.93	1.55	0.29	5.34	1.55

zene, *o*-xylene, and *m,p*-xylene, the medians for outdoor air appeared much larger.

Tables 132 and 133 give a general comparison between the magnitudes of the selected compound levels and the median quantifiable limits by media. For breath and air 1,1,1-trichloroethane, benzene, tetrachloroethylene, *m,p*-dichlorobenzene, ethylbenzene, *o*-xylene, *m,p*-xylene, and *n*-octane seemed high for all five media. However, 1,2-dichloroethane, *o*-dichlorobenzene, *n*-dodecane, and 1,4-dioxane seemed low in all five media. For the other compounds, personal air concentrations appeared high in comparison, while breath and/or outdoor air concentrations appeared low. For water, chloroform, bromodichloromethane, dibromochloromethane, and bromoform seemed high.

Figures 39 through 42 show box plots of benzene, *m,p*-dichlorobenzene, *o*-xylene and *n*-undecane for breath and air. The plots demonstrate the trend for personal air levels to be higher than breath or outdoor air levels. They also show the skewness of some of the distributions.

CORRELATIONS

To further examine the relationships between the media, unweighted Spearman correlations were calculated. Tables 134 and 135 give the Spearman correlations for selected compounds for all amounts. Generally there appeared to be no strong correlations between the media with most correlations less than .50. However, between overnight outdoor air and daytime outdoor air, ethylbenzene, *o*-xylene, *m,p*-xylene, *n*-decane, and *n*-undecane showed correlations in the .64 to .72 range. Between water and the other media, the correlations were all insignificant.

In Tables 136 and 137 the correlations were calculated using measurable amounts only. If the sample size was less than five, the correlation was not reported. Overall, there appeared little change in the correlations from all amounts. However, the correlations between breath and daytime personal air appeared to increase with 1,1,1-trichloroethane, trichloroethylene, and *n*-decane showing significant correlations in the .62 to .84 range. Between water and the other media there appeared to be some increase in the correlations from all amounts but sample sizes were quite limited.

Figures 43 through 66 show scatter plots for breath versus daytime personal air, breath versus daytime outdoor air, and overnight personal

TABLE 132. SUMMARY OF THE MAGNITUDE OF SELECTED COMPOUND LEVELS COMPARED TO THE MEDIAN QUANTIFIABLE LIMITS FOR BREATH AND AIR SAMPLES - LOS ANGELES SECOND SEASON

Compound	Breath	Overnight Personal Air	Daytime Personal Air	Overnight Outdoor Air	Daytime Outdoor Air
Chloroform	low	high	high	low	low
1,2-Dichloroethane	low	low	low	low	low
1,1,1-Trichloroethane	high	high	high	high	high
Benzene	high	high	high	high	high
Carbon Tetrachloride	low	high	high	high	high
Trichloroethylene	low	high	high	high	high
Tetrachloroethylene	high	high	high	low	low
Styrene	low	high	high	high	high
m,p-Dichlorobenzene	high	high	high	high	high
o-Dichlorobenzene	low	low	low	low	low
Ethylbenzene	high	high	high	high	high
o-Xylene	high	high	high	high	high
m,p-Xylene	high	high	high	high	high
n-Decane	low	high	high	low	low
n-Dodecane	low	low	low	low	low
1,4-Dioxane	low	low	low	low	low
n-Octane	high	high	high	high	high
n-Undecane	low	high	high	low	low
a-Pinene	high	high	high	low	low

TABLE 133. SUMMARY OF THE MAGNITUDE OF SELECTED COMPOUND LEVELS COMPARED TO THE MEDIAN QUANTIFIABLE LIMITS FOR WATER - LOS ANGELES SECOND SEASON

Compound	Water
Chloroform	high
1,1,1-Trichloroethane	low
Trichloroethylene	low
Bromodichloromethane	high
Dibromochloromethane	high
Tetrachloroethylene	low
Bromoform	high

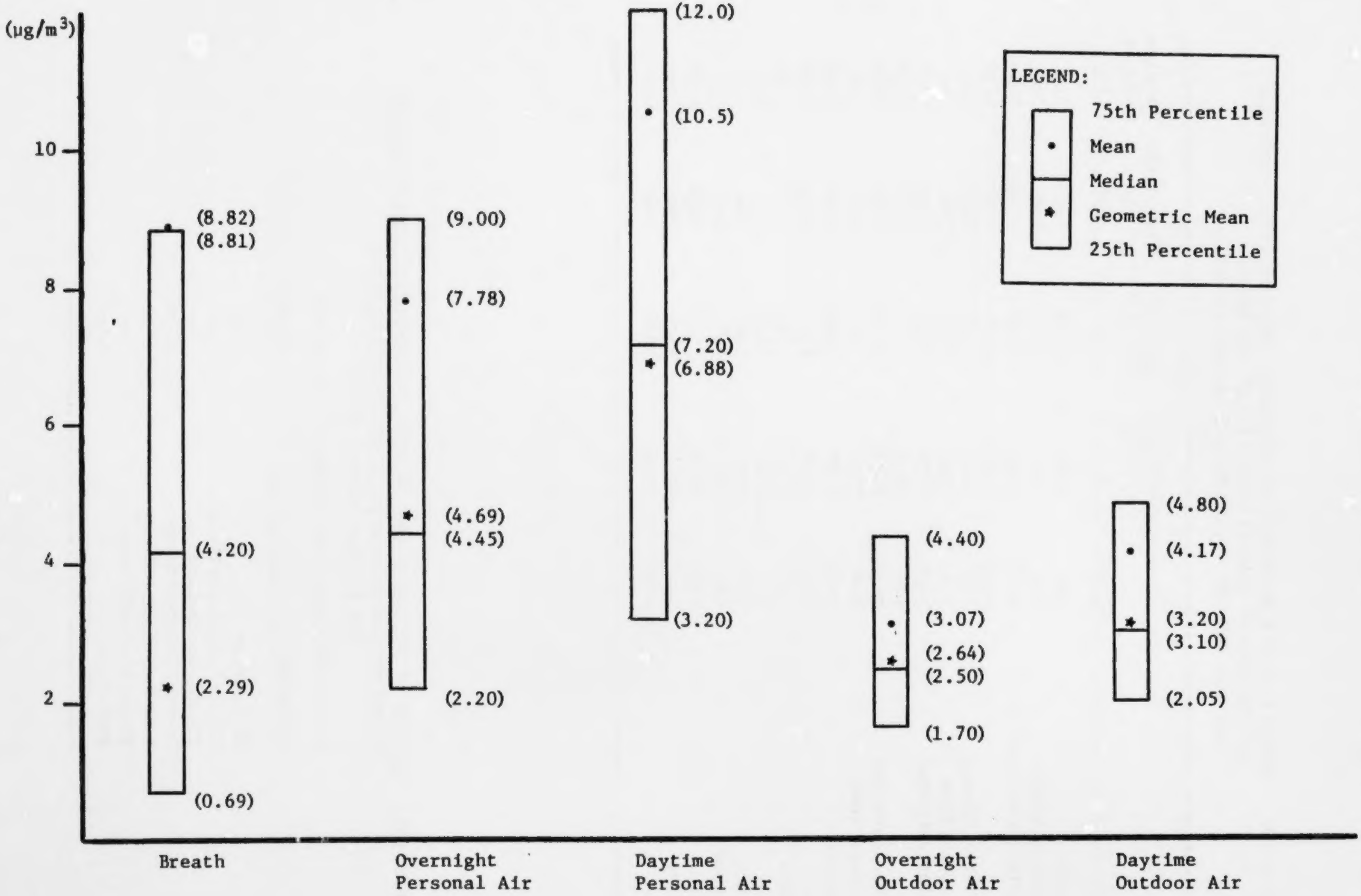


Figure 39. Box plots for weighted arithmetic means, geometric means, medians, 25th and 75th percentiles for benzene - Los Angeles second season.

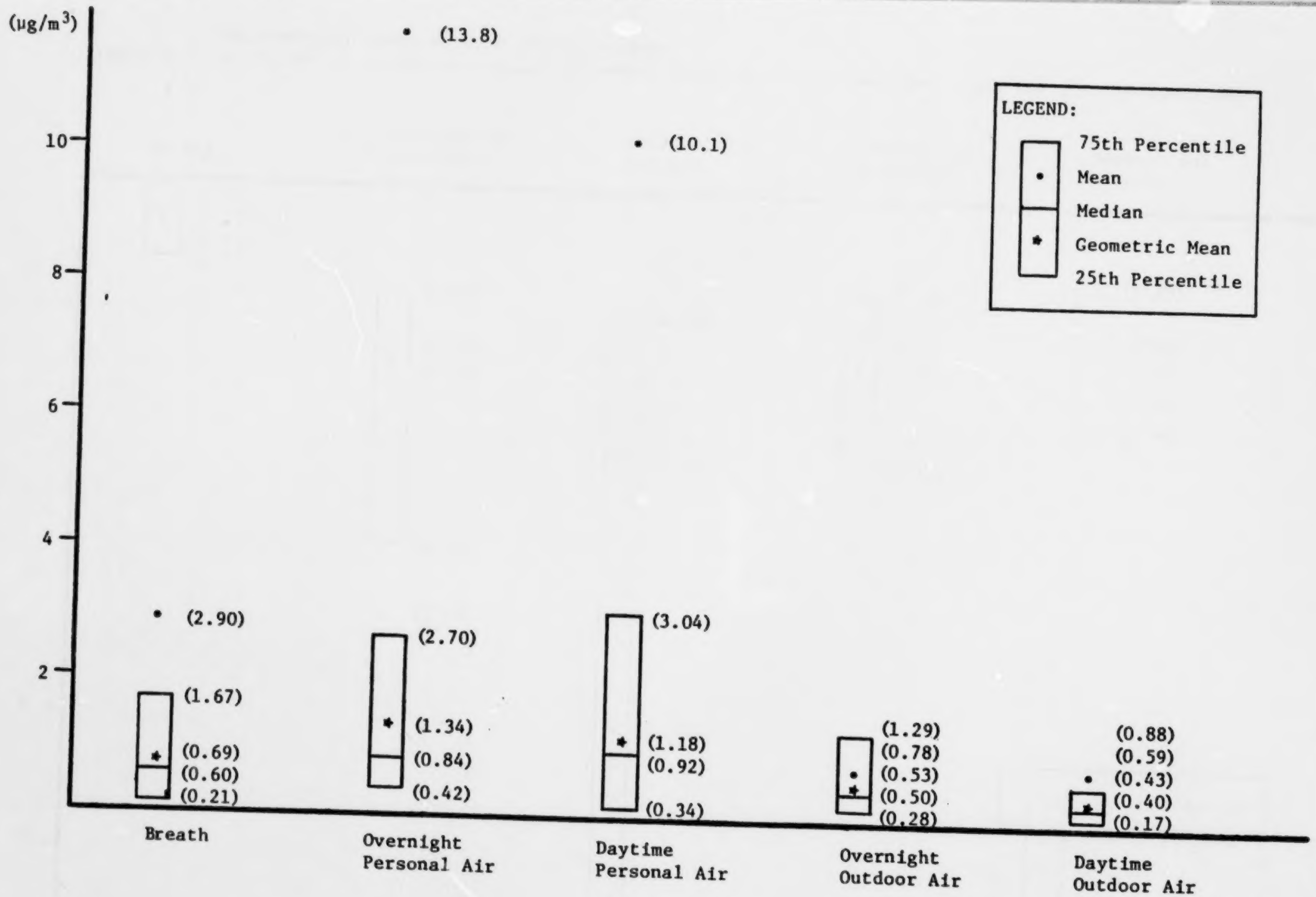


Figure 40. Box plots for weighted arithmetic means, geometric means, medians, 25th and 75th percentiles for m,p-dichlorobenzene - Los Angeles second season.

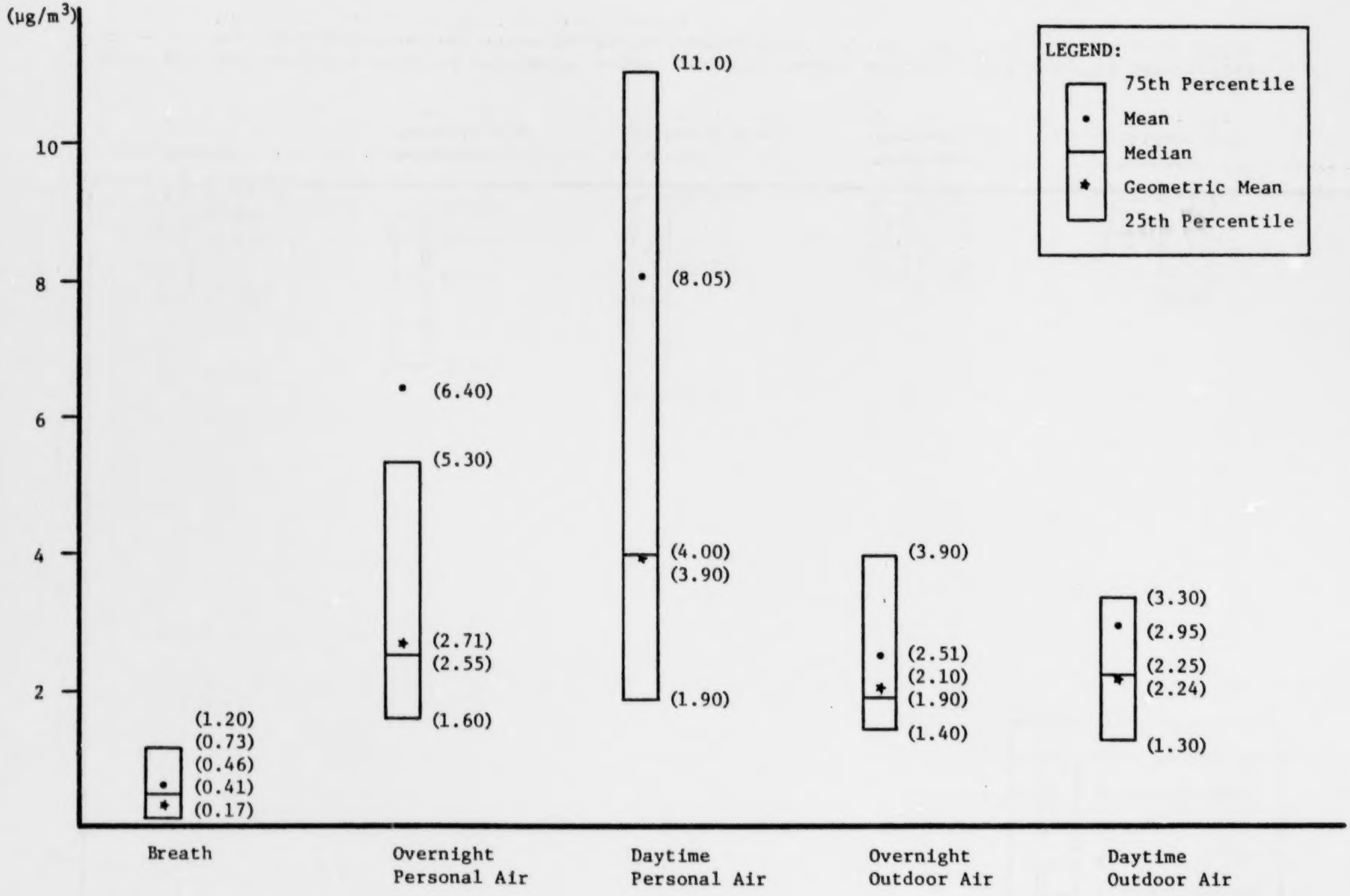


Figure 41. Box plots for weighted arithmetic means, geometric means, medians, 25th and 75th percentiles for o-xylene - Los Angeles second season.

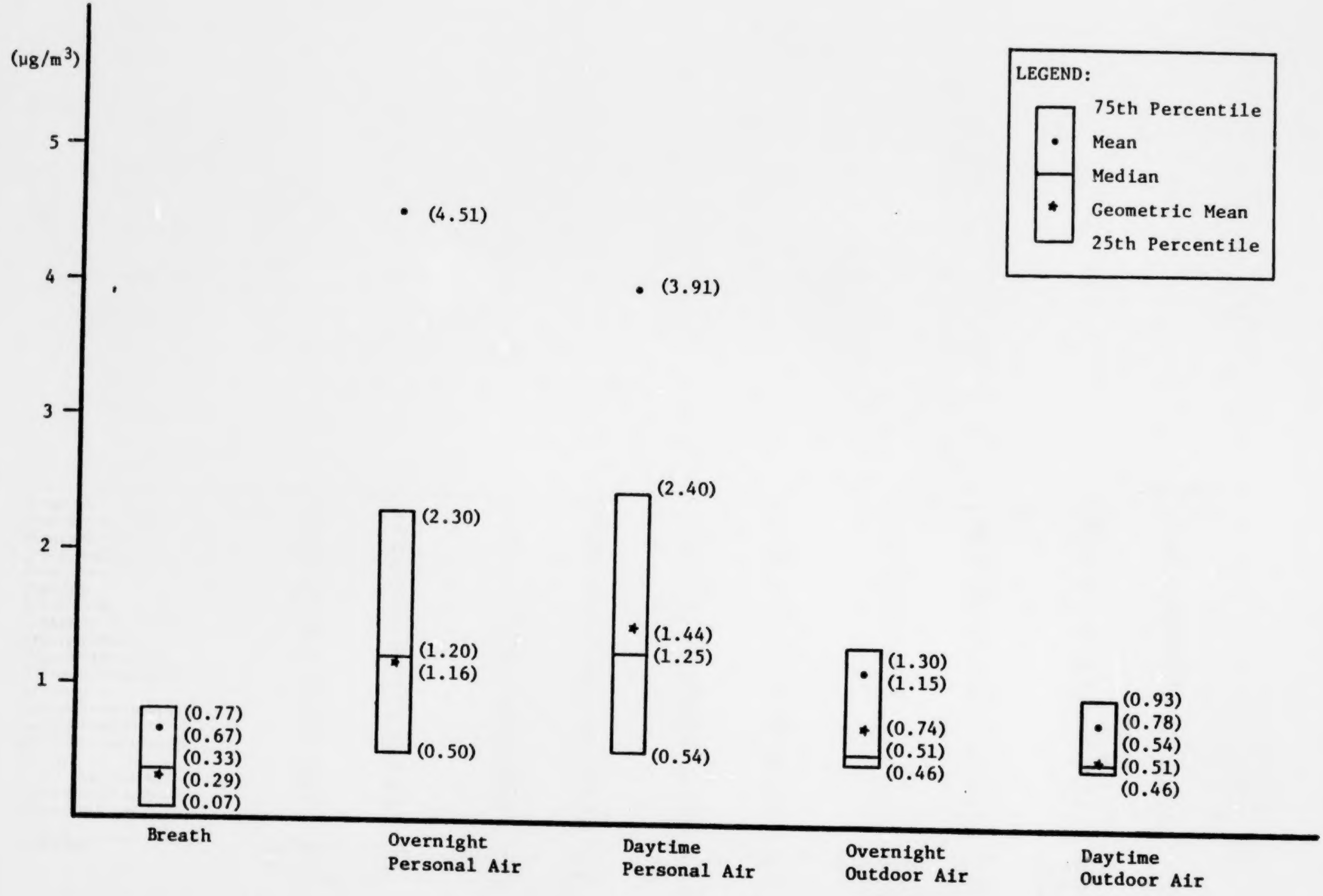


Figure 42. Box plots for weighted arithmetic means, geometric means, medians, 25th and 75th percentiles for n-Undecane - Los Angeles second season.

TABLE 134. SPEARMAN CORRELATIONS BETWEEN MEDIA FOR ALL AMOUNTS OF SELECTED COMPOUNDS - LOS ANGELES SECOND SEASON

	Breath and Overnight Personal Air		Breath and Daytime Personal Air		Breath and Overnight Outdoor Air		Breath and Daytime Outdoor Air		Overnight Personal Air & Daytime Personal Air	
Compound	Spearman Correlation	Sample Size	Spearman Correlation	Sample Size	Spearman Correlation	Sample Size	Spearman Correlation	Sample Size	Spearman Correlation	Sample Size
Chloroform	.04	50	.10	50	.08	23	.12	24	.02	50
1,2-Dichloroethane	-.14	49	.01	50	.05	23	-.12	24	.07	49
1,1,1-Trichloroethane	.29*	50	.60*	50	.30	23	.12	24	.43*	50
Benzene	.14	50	.32*	50	.03	23	.10	24	.23	50
Carbon Tetrachloride	-.19	50	-.03	50	.37	23	.21	24	.18	50
Trichloroethylene	.44*	50	.60*	50	-.10	23	-.04	24	.57*	50
Tetrachloroethylene	.17	50	.30*	50	-.24	23	-.09	24	.47*	50
Styrene	.09	50	.18	50	.06	23	.11	24	.17	50
m,p-Dichlorobenzene	.41*	50	.38*	50	.26	23	.64*	24	.59*	50
o-Dichlorobenzene	-.12	49	-.15	50	-.20	23	-.15	24	-.05	49
Ethylbenzene	.07	50	.36*	50	-.11	23	.12	24	.25	50
o-Xylene	.12	50	.41*	50	-.04	23	-.05	24	.36*	50
m,p-Xylene	.13	50	.44*	50	-.02	23	.14	24	.26	50
n-Decane	-.08	49	.10	50	-.13	23	-.02	24	.14	49
n-Dodecane	.31*	49	.13	49	.09	23	-.28	24	.27	48
1,4-Dioxane	-.06	50	-.17	50	.04	23	-.38	24	-.00	50
n-Octane	-.07	50	.23	50	.11	23	.37	24	.08	50
n-Undecane	.15	49	.02	49	-.17	23	-.03	24	.08	48
a-Pinene	.24	50	.12	50	.28	23	.27	24	.30*	50

continued

TABLE 134 (continued)

Compound	Overnight Personal Air and Overnight Outdoor Air		Overnight Personal Air and Daytime Outdoor Air		Daytime Personal Air and Overnight Outdoor Air		Daytime Personal Air and Daytime Outdoor Air		Overnight Outdoor Air and Daytime Outdoor Air	
	Spearman Correlation	Sample Size	Spearman Correlation	Sample Size	Spearman Correlation	Sample Size	Spearman Correlation	Sample Size	Spearman Correlation	Sample Size
Chloroform	.14	22	.02	23	.14	23	-.02	24	.38	23
1,2-Dichloroethane	-.40	22	.17	23	-.50*	23	.00	24	.03	23
1,1,1-Trichloroethane	.59*	22	.46*	23	.39	23	.17	24	.49*	23
Benzene	-.02	22	.01	23	.13	23	.14	24	.46*	23
Carbon Tetrachloride	.11	22	-.10	23	-.15	23	-.23	24	.30	23
Trichloroethylene	-.13	22	.06	23	-.13	23	-.18	24	-.04	23
Tetrachloroethylene	.32	22	.20	23	.25	23	.25	24	.26	23
Styrene	.18	22	.26	23	.28	23	.13	24	.01	23
m,p-Dichlorobenzene	.08	22	.47*	23	.28	23	.63*	24	.56*	23
o-Dichlorobenzene	.21	22	.23	23	-.22	23	.44*	24	-.05	23
Ethylbenzene	.37	22	.40	23	.12	23	.05	24	.65*	23
o-Xylene	.32	22	.36	23	.13	23	.20	24	.69*	23
m,p-Xylene	.55*	22	.43*	23	-.02	23	.13	24	.64*	23
n-Decane	.22	22	.29	23	.32	23	.14	24	.67*	23
n-Dodecane	-.06	22	.15	23	.21	22	-.01	23	.32	23
1,4-Dioxane	.14	22	.09	23	-.13	23	.01	24	-.10	23
n-Octane	.19	22	.28	23	.44*	23	.24	24	.50*	23
n-Undecane	.09	22	.27	23	.21	22	.33	23	.72*	23
a-Pinene	-.00	22	.03	23	.48*	23	.39	24	.54*	23

* Significantly different from zero at .05 level.

TABLE 135. SPEARMAN CORRELATIONS BETWEEN WATER AND THE OTHER MEDIA FOR ALL AMOUNTS OF SELECTED COMPOUNDS - LOS ANGELES SECOND SEASON

	Breath		Overnight Personal Air		Daytime Personal Air		Overnight Outdoor Air		Daytime Outdoor Air	
Compound	Spearman Correlation	Sample Size	Spearman Correlation	Sample Size	Spearman Correlation	Sample Size	Spearman Correlation	Sample Size	Spearman Correlation	Sample Size
Chloroform	.19	51	.12	51	-.07	51	.01	23	-.21	24
1,1,1-Trichloroethane	.13	51	-.04	51	-.03	51	-.03	23	-.06	24
Trichloroethylene	.00	51	-.03	51	-.14	51	-.11	23	-.20	24
Bromodichloromethane	.04	51								
Dibromochloromethane	-.17	51								
Tetrachloroethylene	.18	51	.19	51	.13	51	-.13	23	-.08	24
Bromoform	.06	51								

* Significantly different from zero at .05 level.

TABLE 136. SPEARMAN CORRELATIONS BETWEEN MEDIA FOR MEASURABLE AMOUNTS ONLY OF SELECTED COMPOUNDS - LOS ANGELES SECOND SEASON

Compound	Breath and Overnight Personal Air		Breath and Daytime Personal Air		Breath and Overnight Outdoor Air		Breath and Daytime Outdoor Air		Overnight Personal Air & Daytime Personal Air	
	Spearman Correlation	Sample Size	Spearman Correlation	Sample Size	Spearman Correlation	Sample Size	Spearman Correlation	Sample Size	Spearman Correlation	Sample Size
Chloroform	-.21	17	.17	14		2		4	.16	26
1,2-Dichloroethane		0		0		0		0		0
1,1,1-Trichloroethane	.24	44	.62*	45	.30	21	.19	22	.43*	5
Benzene	-.01	38	.25	40	.16	18	.11	18	.25	48
Carbon Tetrachloride	.22	5	-.10	5		2		2	.08	48
Trichloroethylene	.14	19	.84*	19		0		2	.40	23
Tetrachloroethylene	.22	48	.36*	49	-.24	23	-.09	24	.40*	48
Styrene	.52	14	.12	21	.28	9	.23	9	-.09	34
m,p-Dichlorobenzene	.40*	29	.40*	27	.02	10	.60*	13	.69*	38
o-Dichlorobenzene		0		0		0		0		2
Ethylbenzene	-.11	35	.45*	37	.38	17	.29	17	.11	47
o-Xylene	.09	32	.51*	31	-.07	15	-.22	15	.30*	46
m,p-Xylene	.13	50	.44*	50	-.02	23	.14	24	.26	50
n-Decane	.67	5	.63*	13		2		3	.52*	25
n-Dodecane		4	.66	6		2		2	.66	6
1,4-Dioxane		0		0		0		0		2
n-Octane	.06	29	.38*	31	-.13	11	.53	11	.13	43
n-Undecane	.13	15	.34	18	.70	6	.56	7	.14	22
a-Pinene	.08	31	.10	30	.15	9	-.12	11	.26	37

continued

TABLE 136 (continued)

Compound	Overnight Personal Air and Overnight Outdoor Air		Overnight Personal Air and Daytime Outdoor Air		Daytime Personal Air and Overnight Outdoor Air		Daytime Personal Air and Daytime Outdoor Air		Overnight Outdoor Air and Daytime Outdoor Air	
	Spearman Correlation	Sample Size	Spearman Correlation	Sample Size	Spearman Correlation	Sample Size	Spearman Correlation	Sample Size	Spearman Correlation	Sample Size
Chloroform	.49	6	-.54	7	.46	7	-.32	7		4
1,2-Dichloroethane		0		0		0		1		0
1,1,1-Trichloroethane	.59*	22	.46*	23	.39	23	.17	24	.49*	23
Benzene	-.02	22	.01	23	.13	23	.14	24	.46*	23
Carbon Tetrachloride	.11	22	-.10	23	-.15	23	-.23	24	.30	23
Trichloroethylene		2		2		1		2		0
Tetrachloroethylene	.32	22	.20	23	.25	23	.25	24	.26	23
Styrene	.30	14	.09	15	.39	18	.14	19	.17	18
m,p-Dichlorobenzene	.06	15	.41	17	.12	14	.49	14	.83*	15
o-Dichlorobenzene		1		1		1		0		0
Ethylbenzene	.37	22	.31	22	.12	23	-.06	23	.65*	23
o-Xylene	.32	22	.36	23	.09	22	.15	23	.69*	23
m,p-Xylene	.55*	22	.43*	23	-.02	23	.13	24	.64*	23
n-Decane	.76*	8	.47	7	.51	11	.04	11	.61	10
n-Dodecane		2		4		4		3	.77*	7
1,4-Dioxane		1		2		0		0		1
n-Octane	-.13	17	.13	13	.20	18	.17	15	.18	13
n-Undecane	.36	5	.23	6	.53	8	.02	9	.60	10
a-Pinene	.14	8	.17	8	-.02	10	-.64*	10	.70	6

* Significantly different from zero at .05 level.

TABLE 137. SPEARMAN CORRELATIONS BETWEEN WATER AND THE OTHER MEDIA FOR MEASURABLE AMOUNTS ONLY OF SELECTED COMPOUNDS - LOS ANGELES SECOND SEASON

	Breath		Overnight Personal Air		Daytime Personal Air		Overnight Outdoor Air		Daytime Outdoor Air	
Compound	Spearman Corre-lation	Sample Size	Spearman Corre-lation	Sample Size	Spearman Corre-lation	Sample Size	Spearman Corre-lation	Sample Size	Spearman Corre-lation	Sample Size
Chloroform	-.04	18	.07	36	.39*	26	.03	6	-.41	6
1,1,1-Trichloroethane	-.36	7	.11	7	-.21	7		2		2
Trichloroethylene		4	-.30	5	-.80	5		0		0
Bromodichloromethane	.21	6								
Dibromochloromethane		2								
Tetrachloroethylene	.69*	13	.28	12	.02	11		3		3
Bromoform		0								

* Significantly different from zero at .05 level.

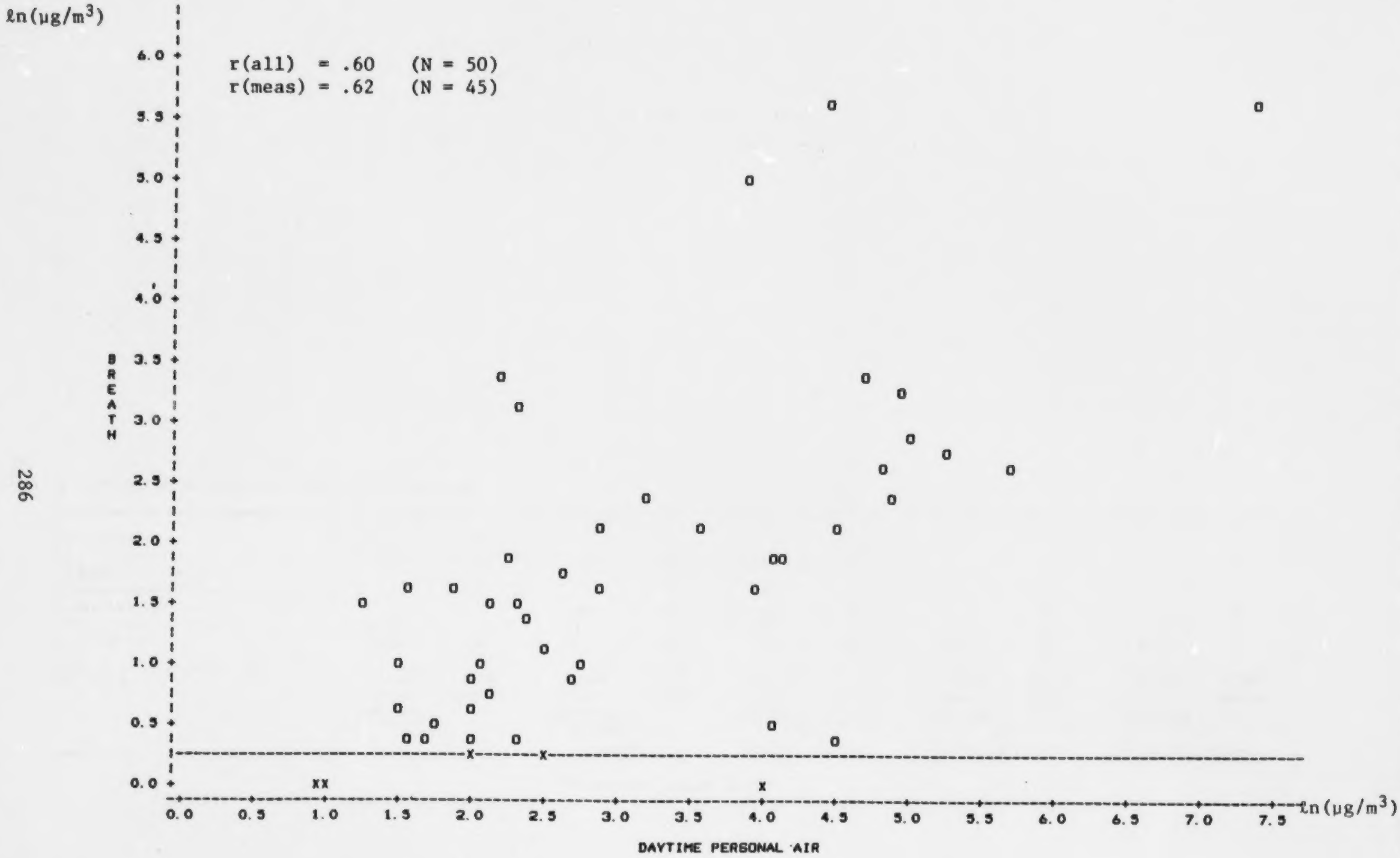


Figure 43. 1,1,1-Trichloroethane - Los Angeles second season.

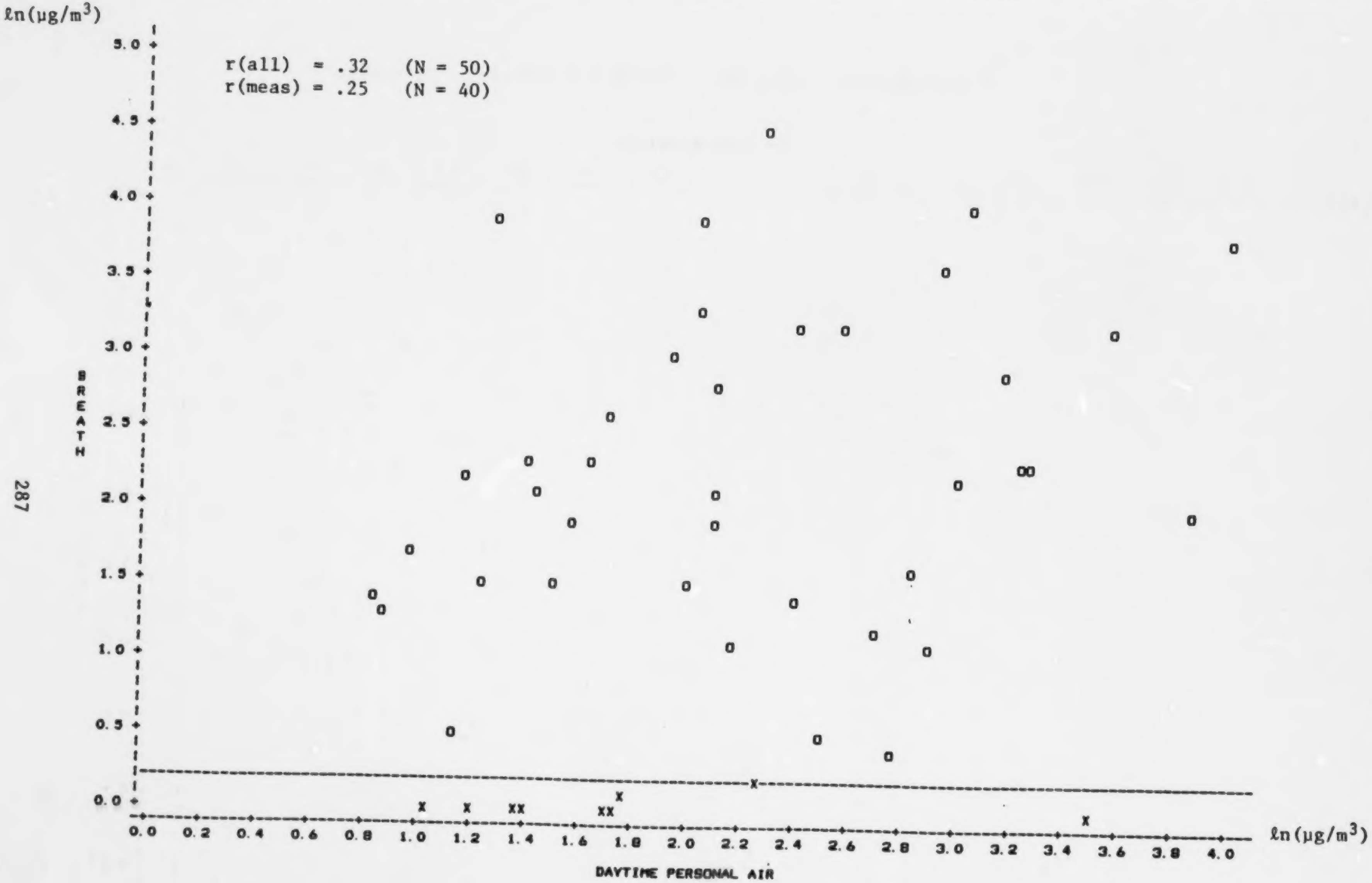


Figure 44. Benzene - Los Angeles second season.

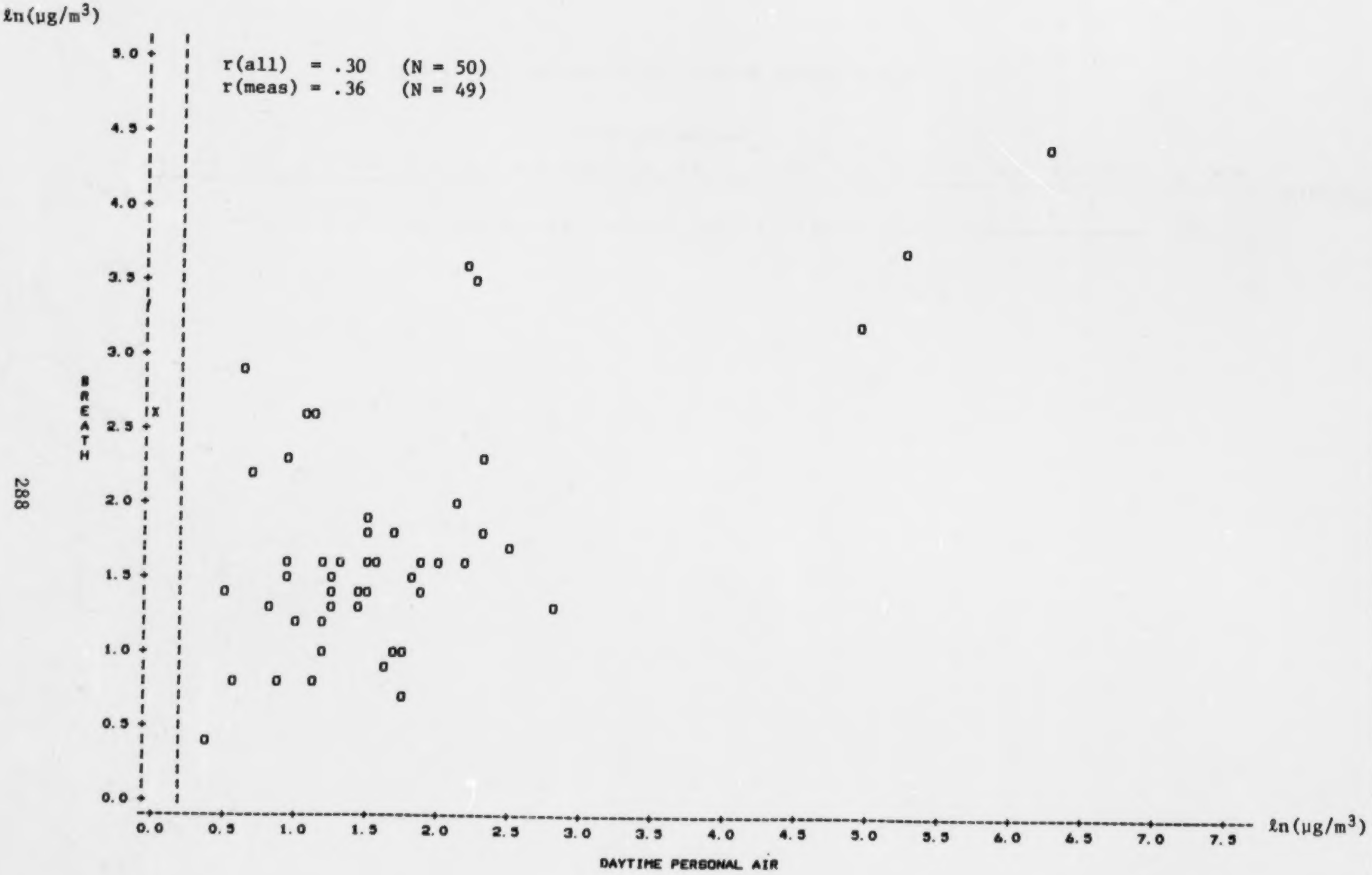


Figure 45. Tetrachloroethylene - Los Angeles second season.

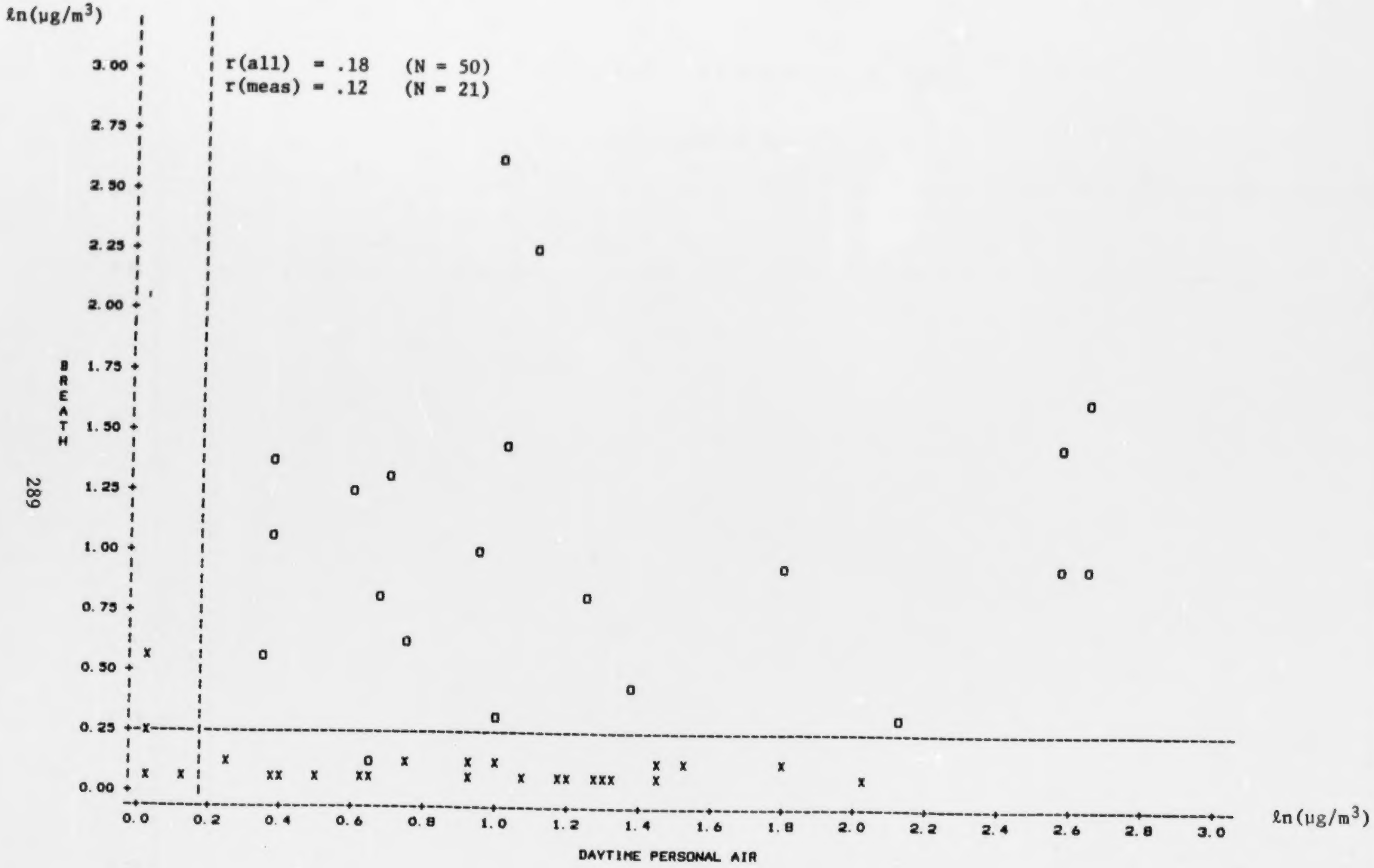


Figure 46. Styrene - Los Angeles second season.

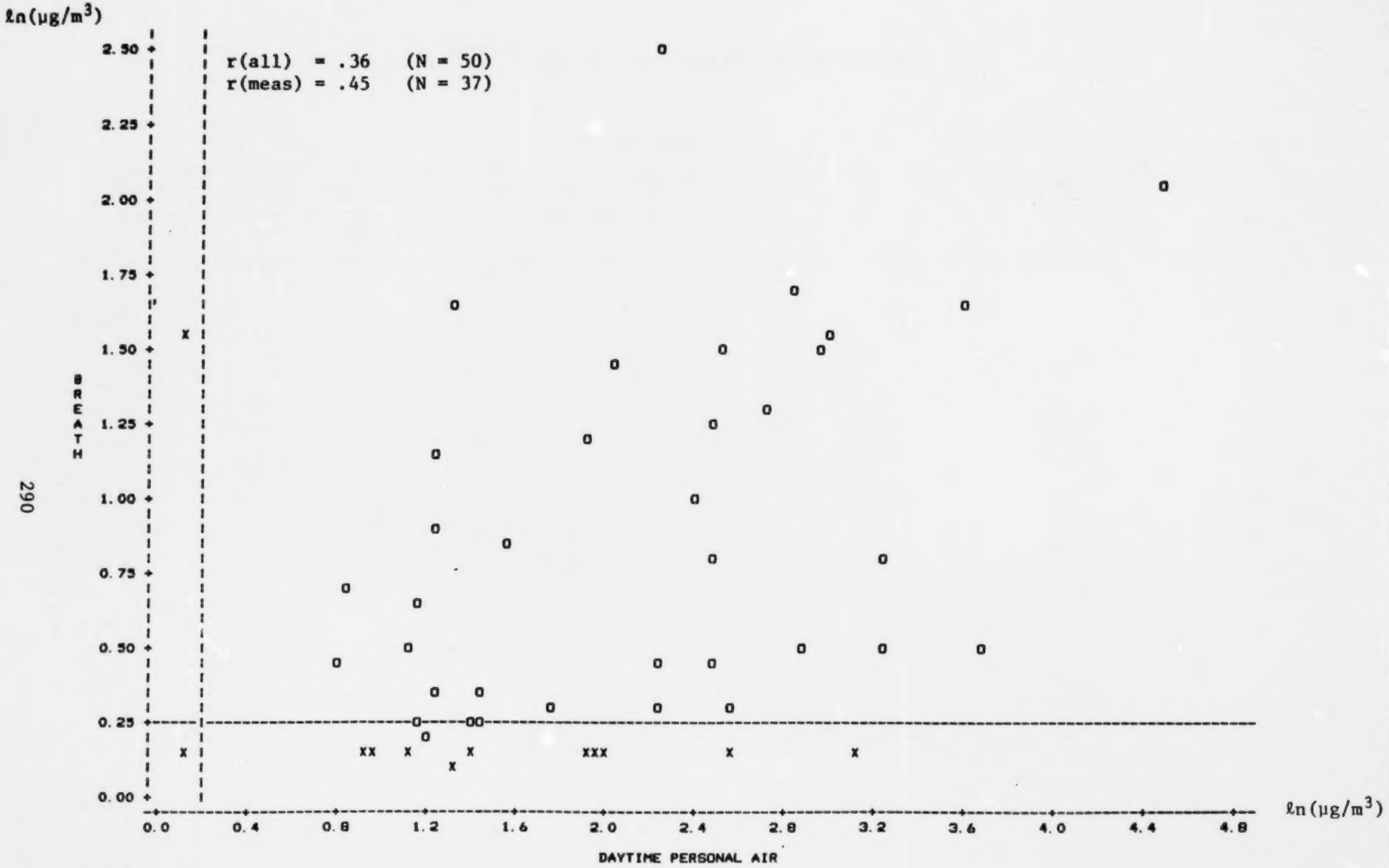


Figure 47. Ethylbenzene - Los Angeles second season.

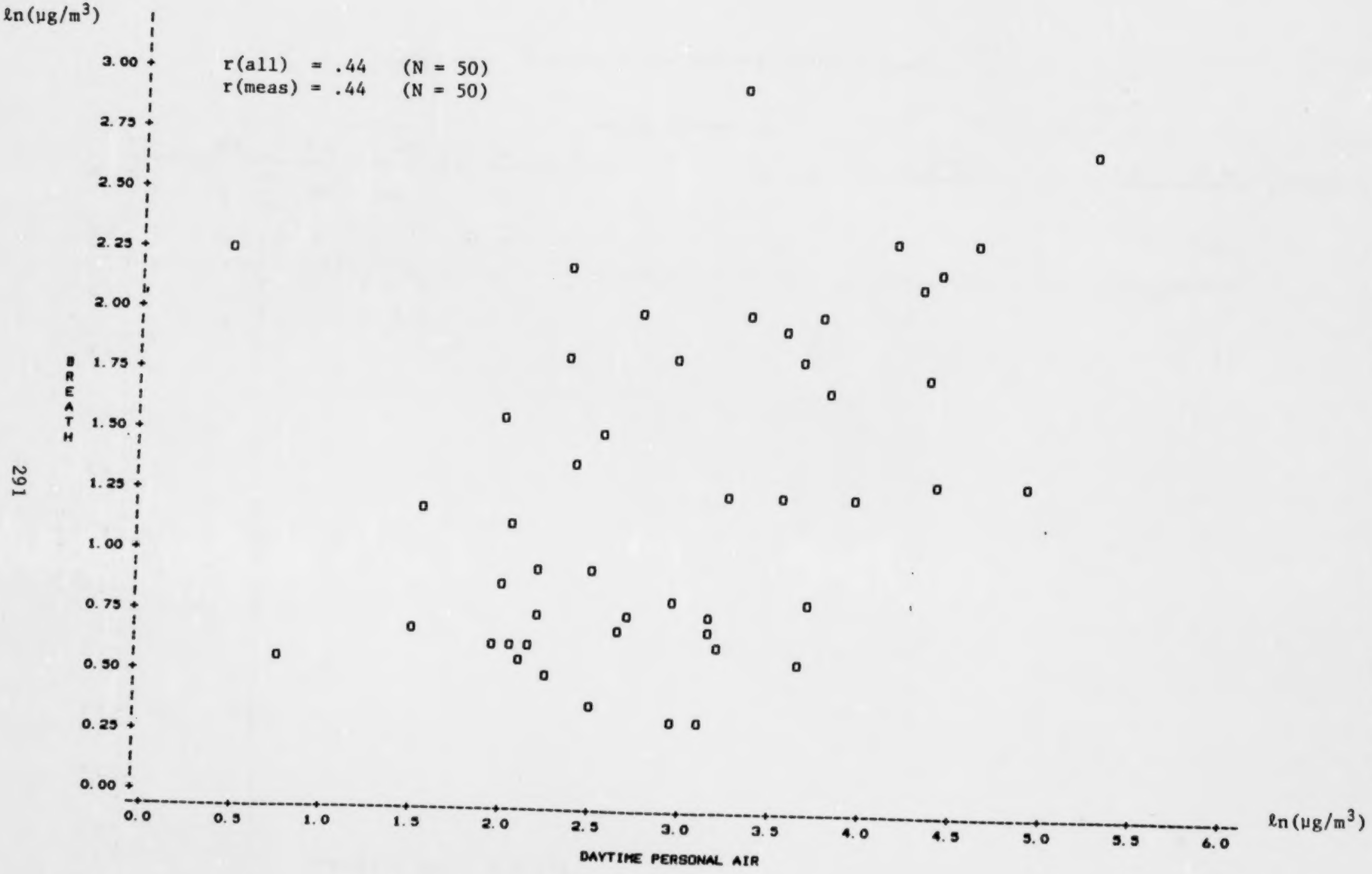


Figure 48. m,p-Xylene - Los Angeles second season.

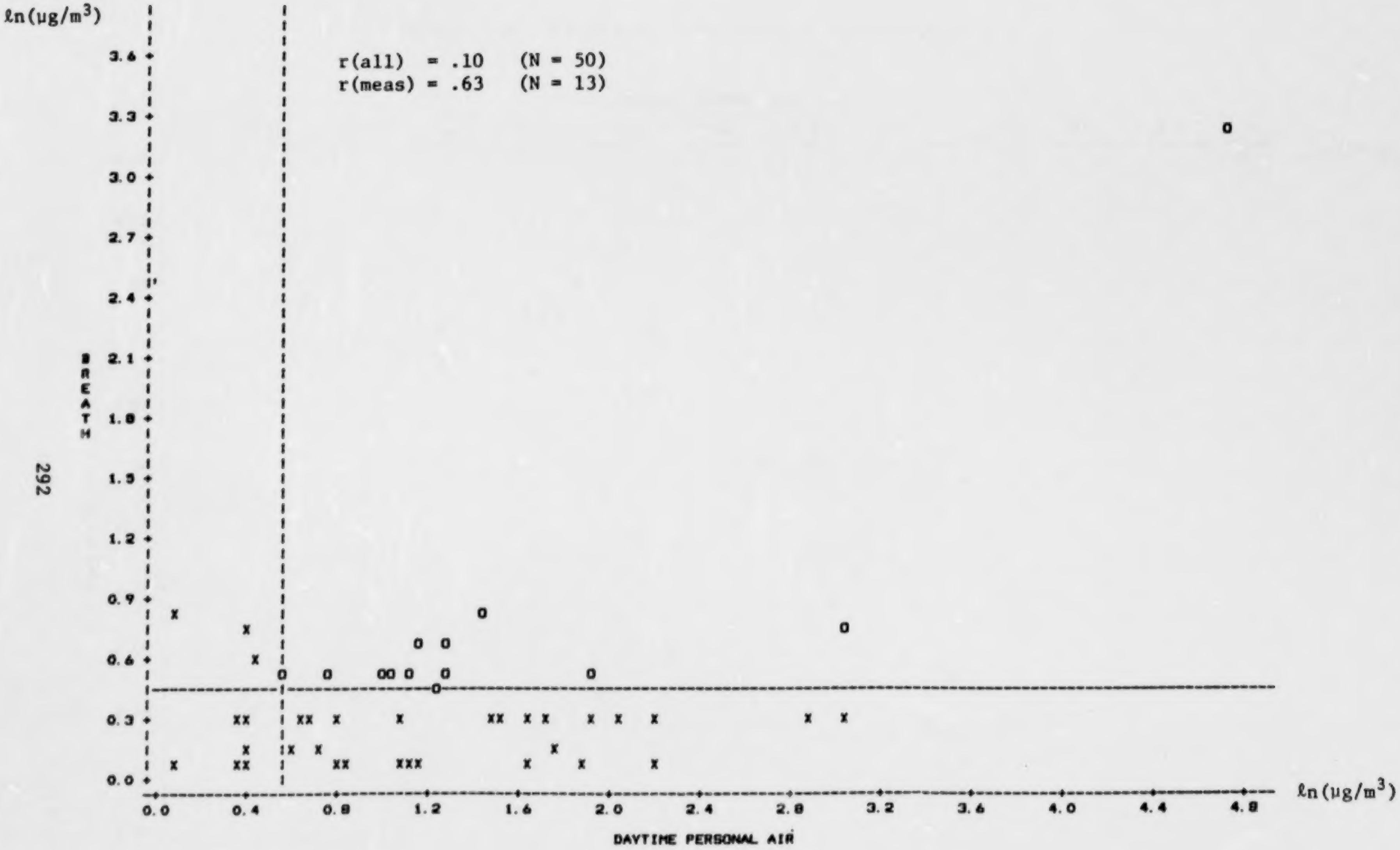


Figure 49. n-Decane - Los Angeles second season.

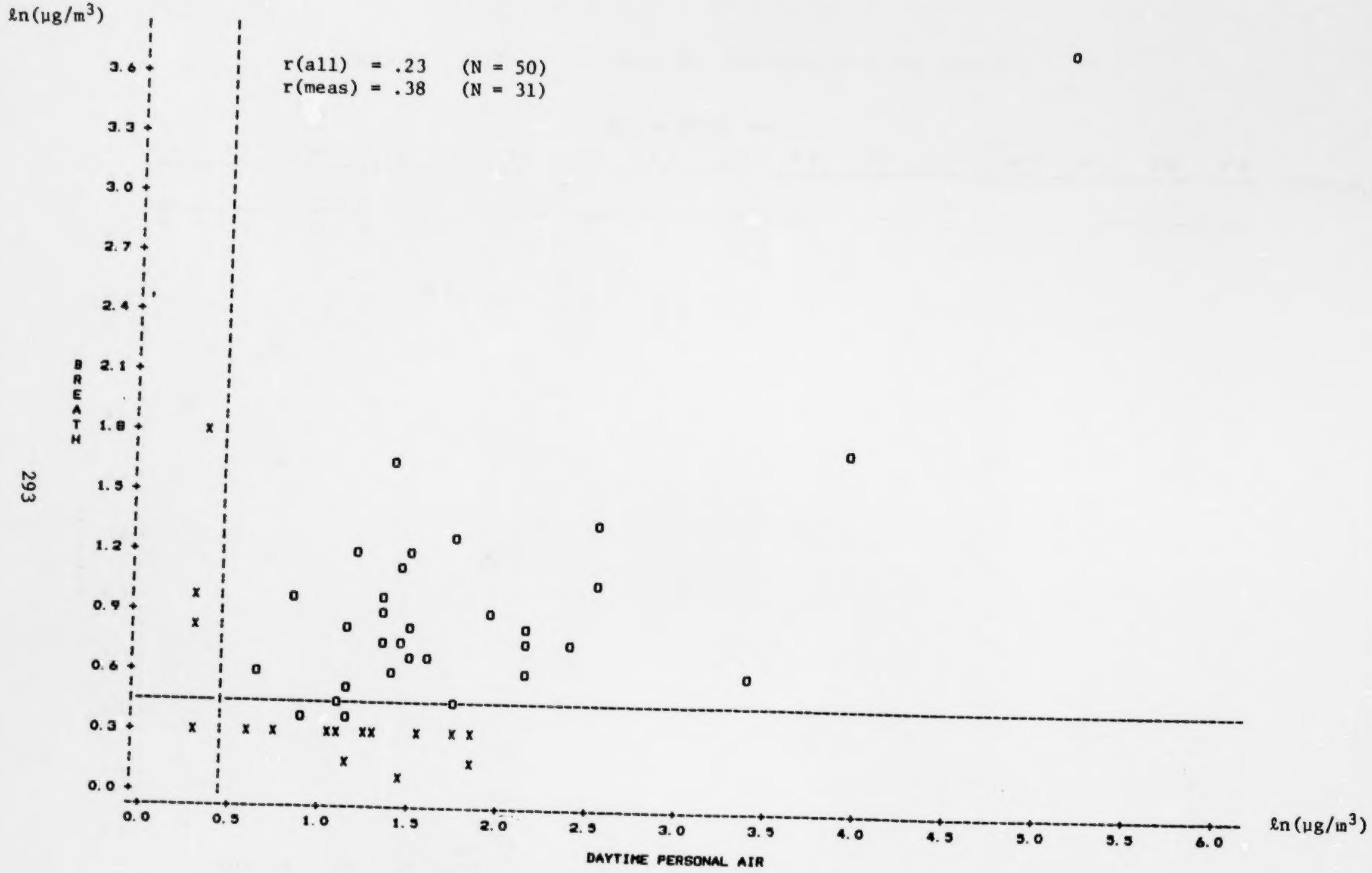


Figure 50. n-Octane - Los Angeles second season.

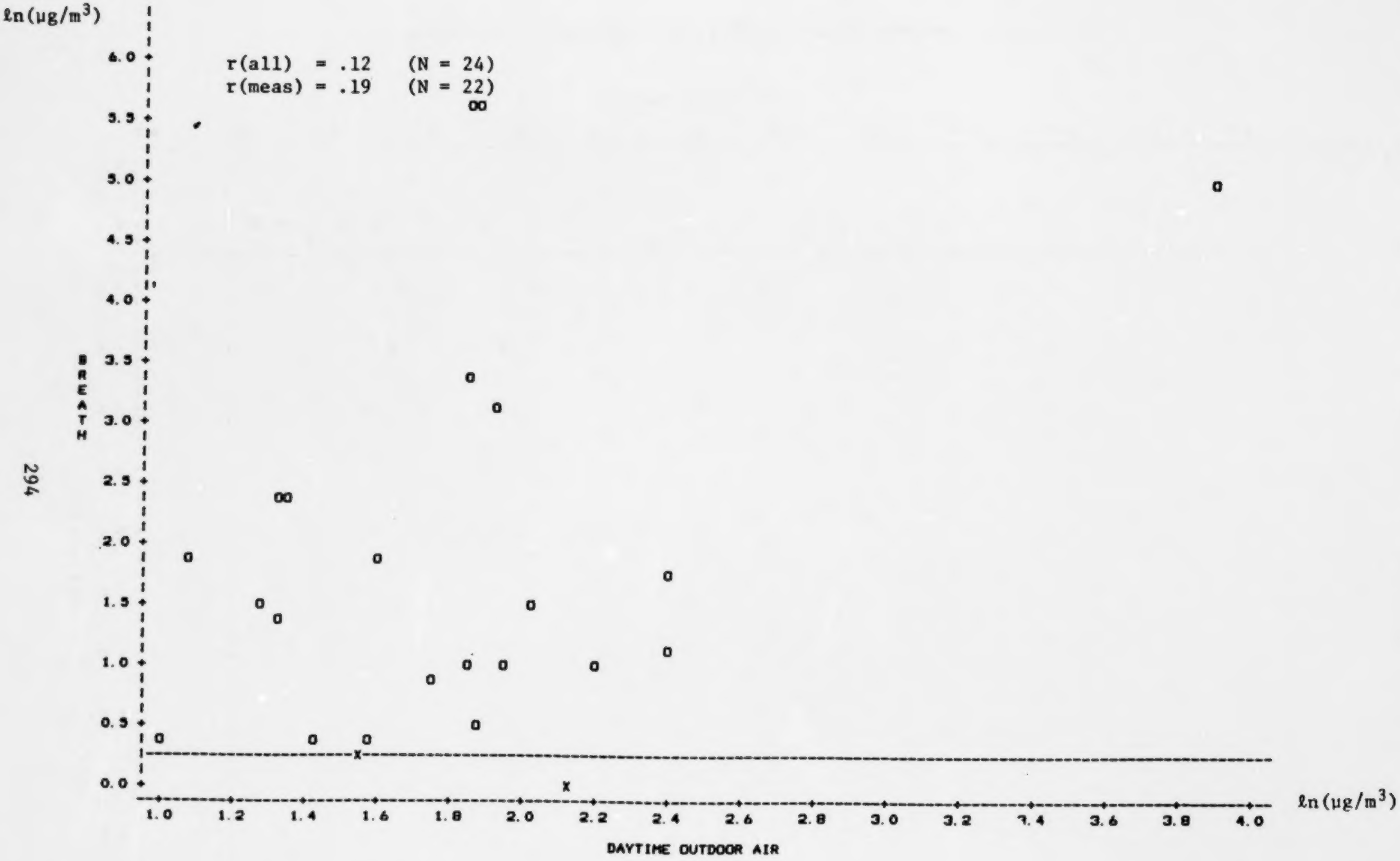
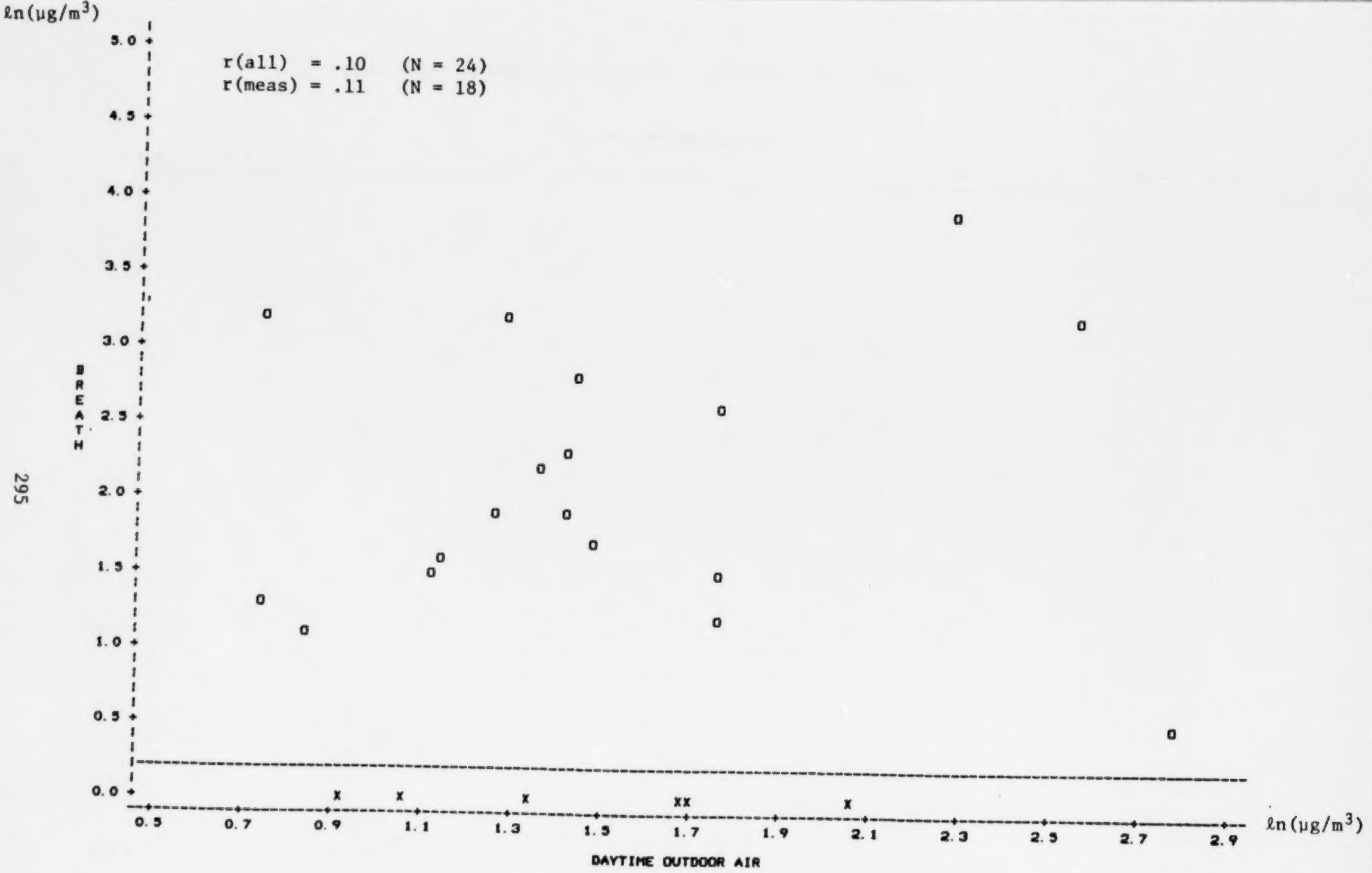


Figure 51. 1,1,1-Trichloroethane - Los Angeles second season.



r(all) = .10 (N = 24)
r(meas) = .11 (N = 18)

Figure 52. Benzene - Los Angeles second season.

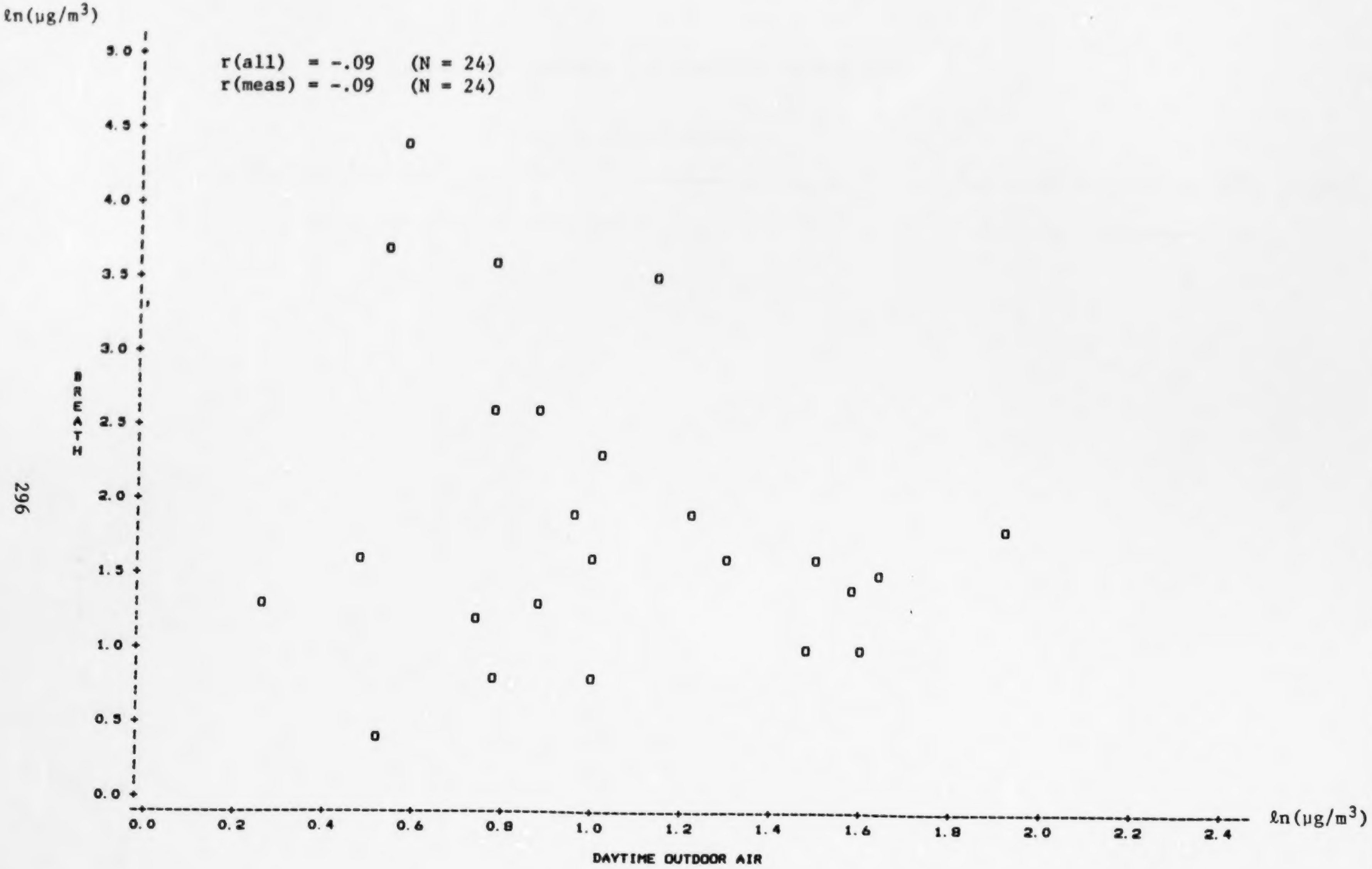


Figure 53. Tetrachloroethylene - Los Angeles second season.

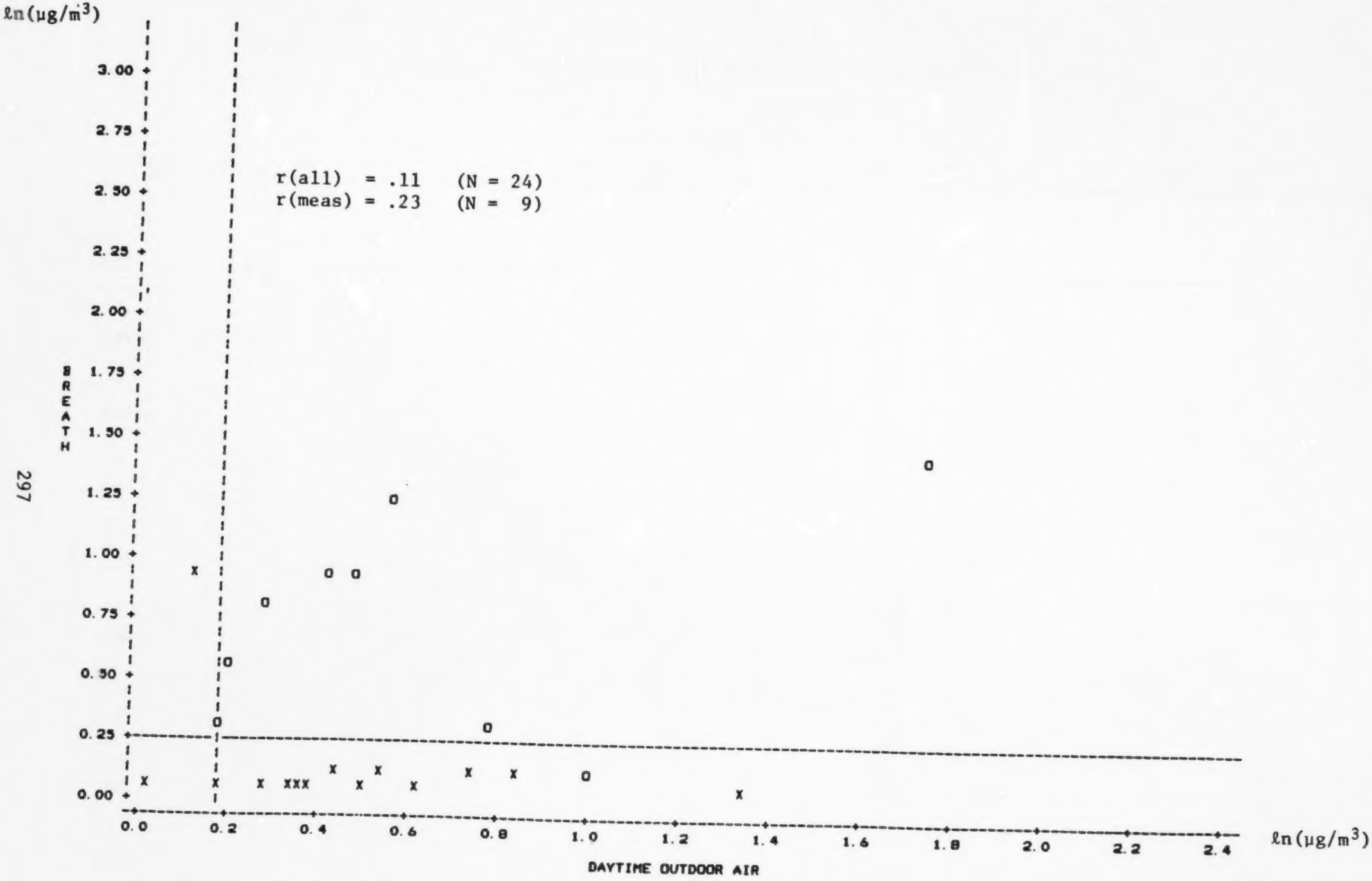


Figure 54. Styrene - Los Angeles second season.

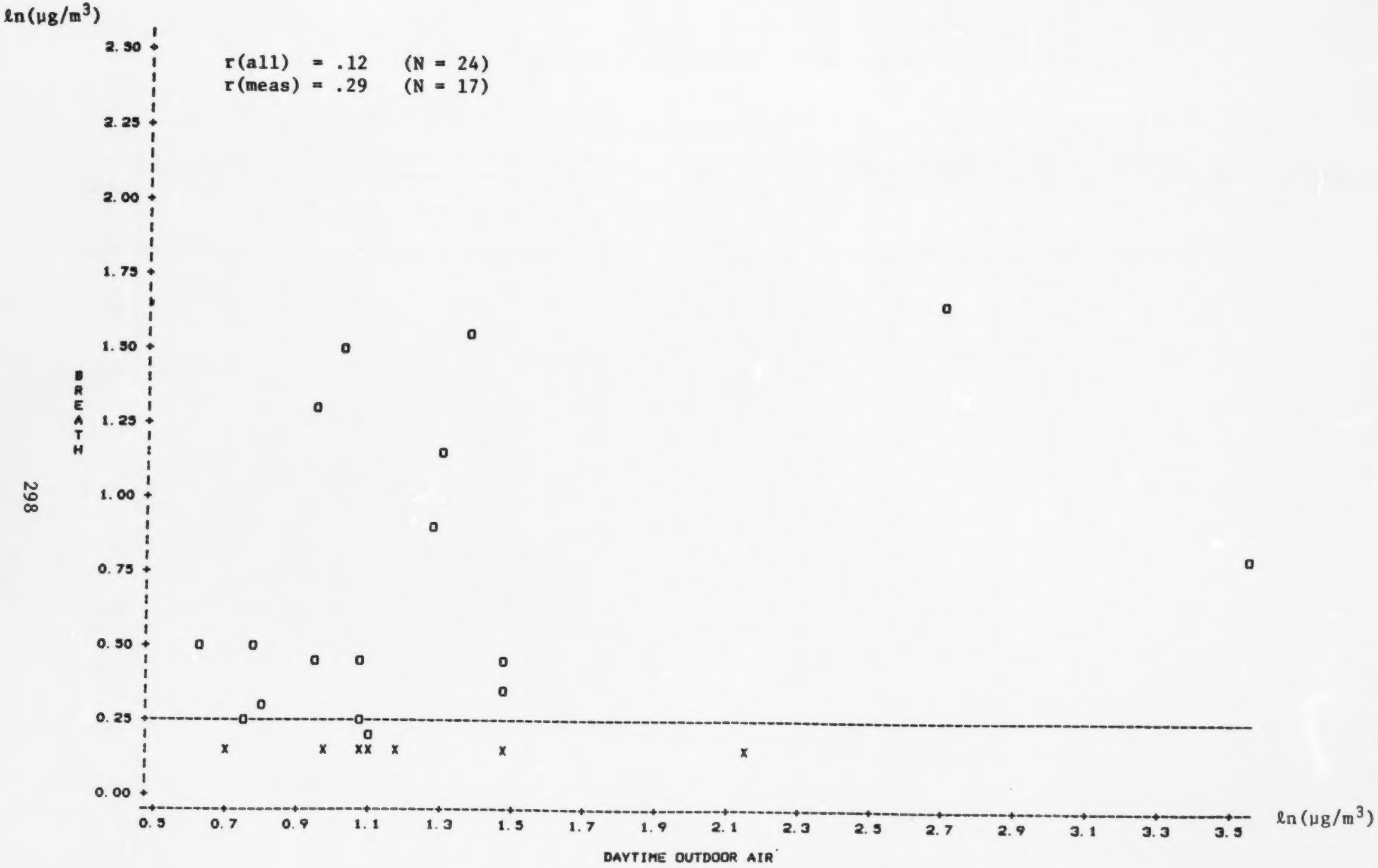


Figure 55. Ethylbenzene - Los Angeles second season.

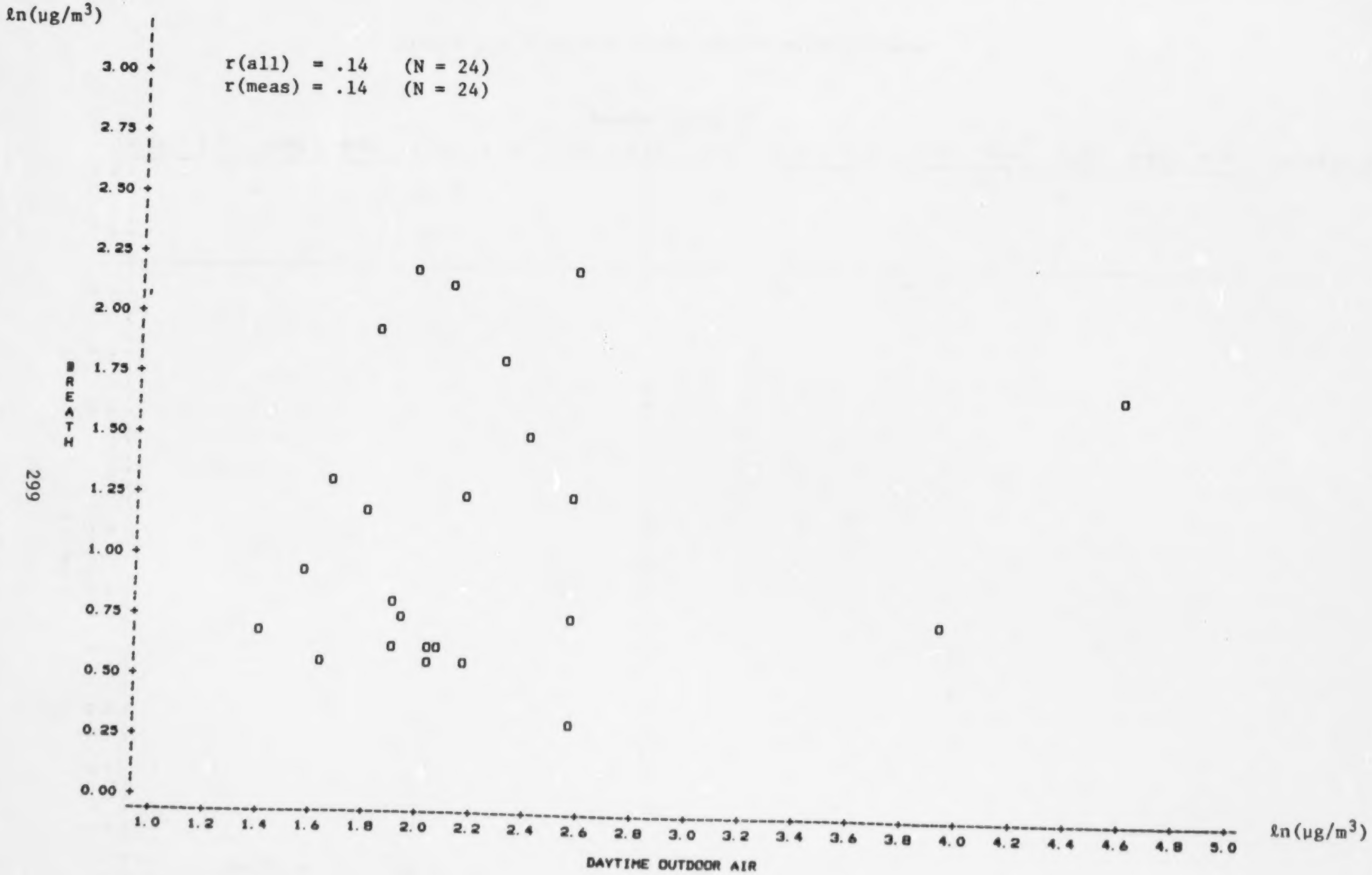


Figure 56. m,p-Xylene - Los Angeles second season.

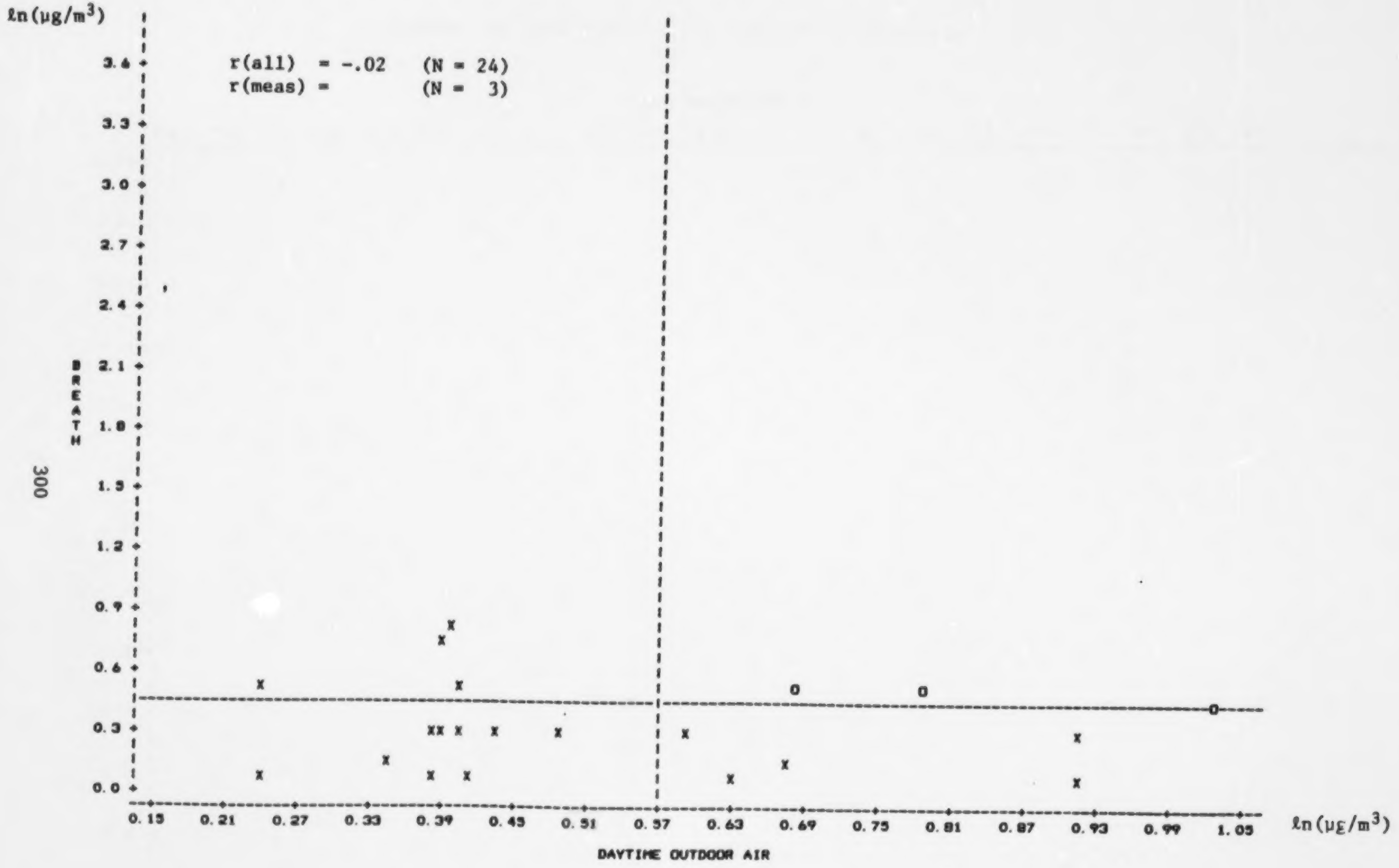


Figure 57. n-Decane - Los Angeles second season.

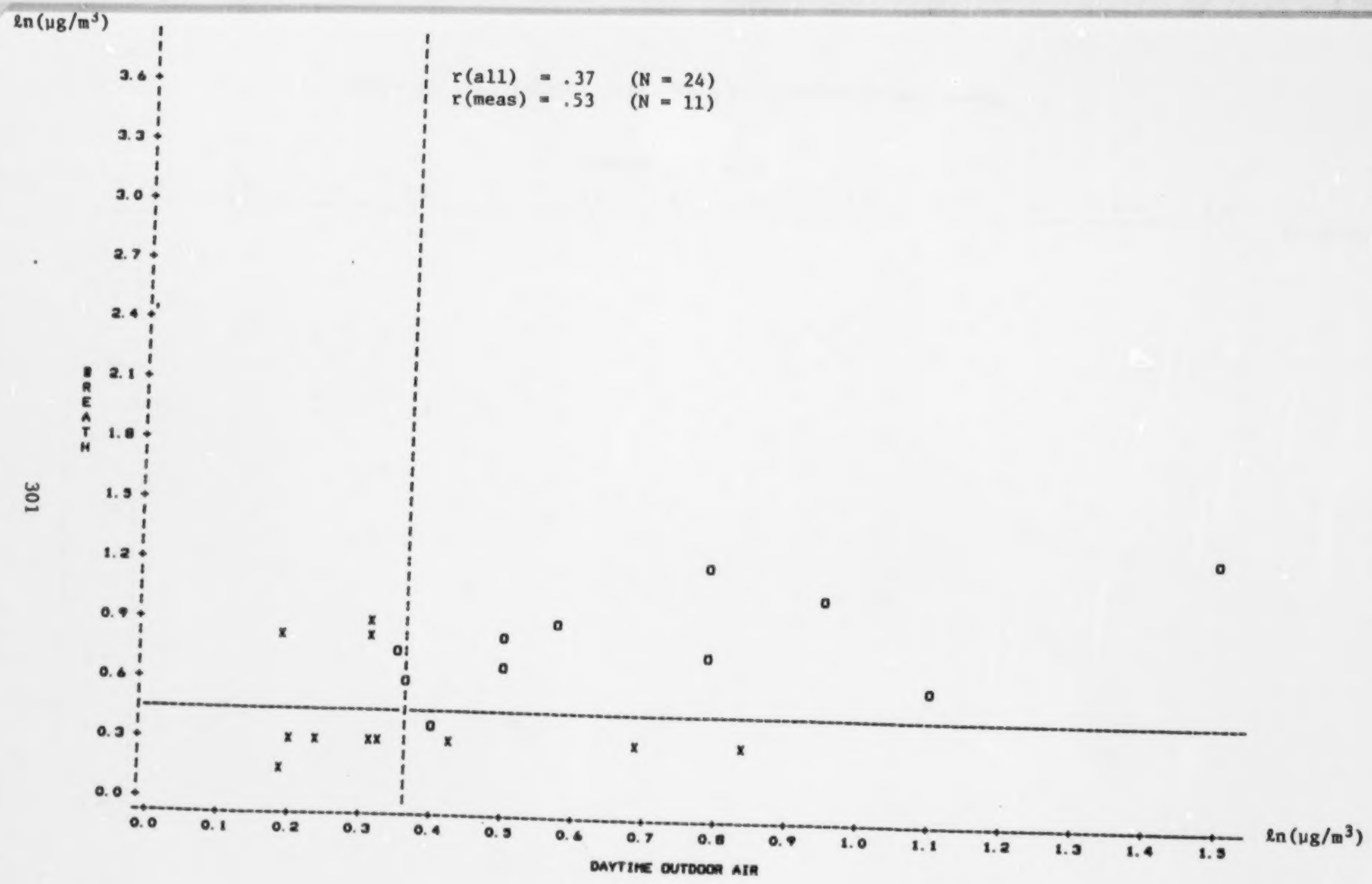


Figure 58. n-Octane - Los Angeles second season.

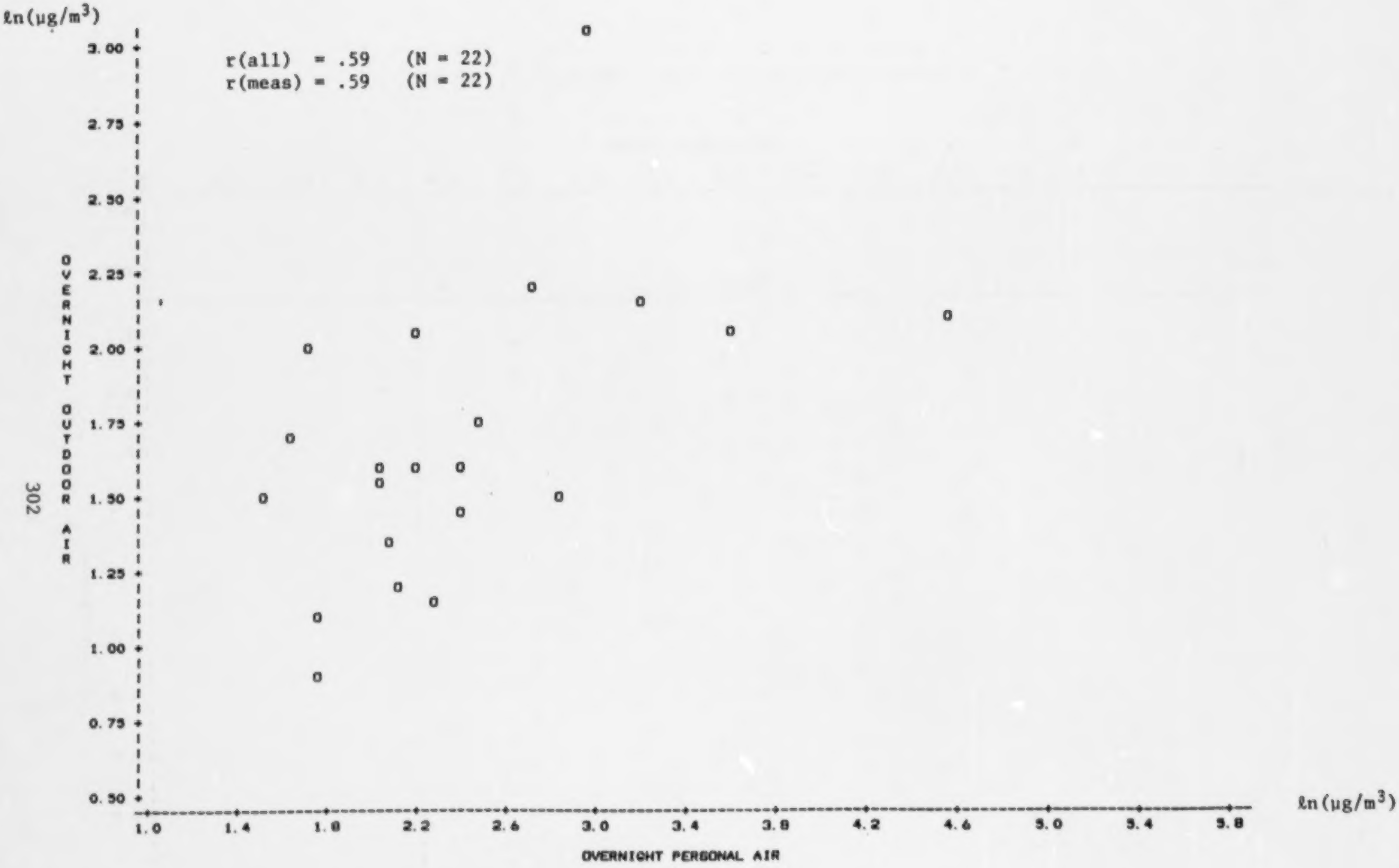


Figure 59. 1,1,1-Trichloroethane - Los Angeles second season.

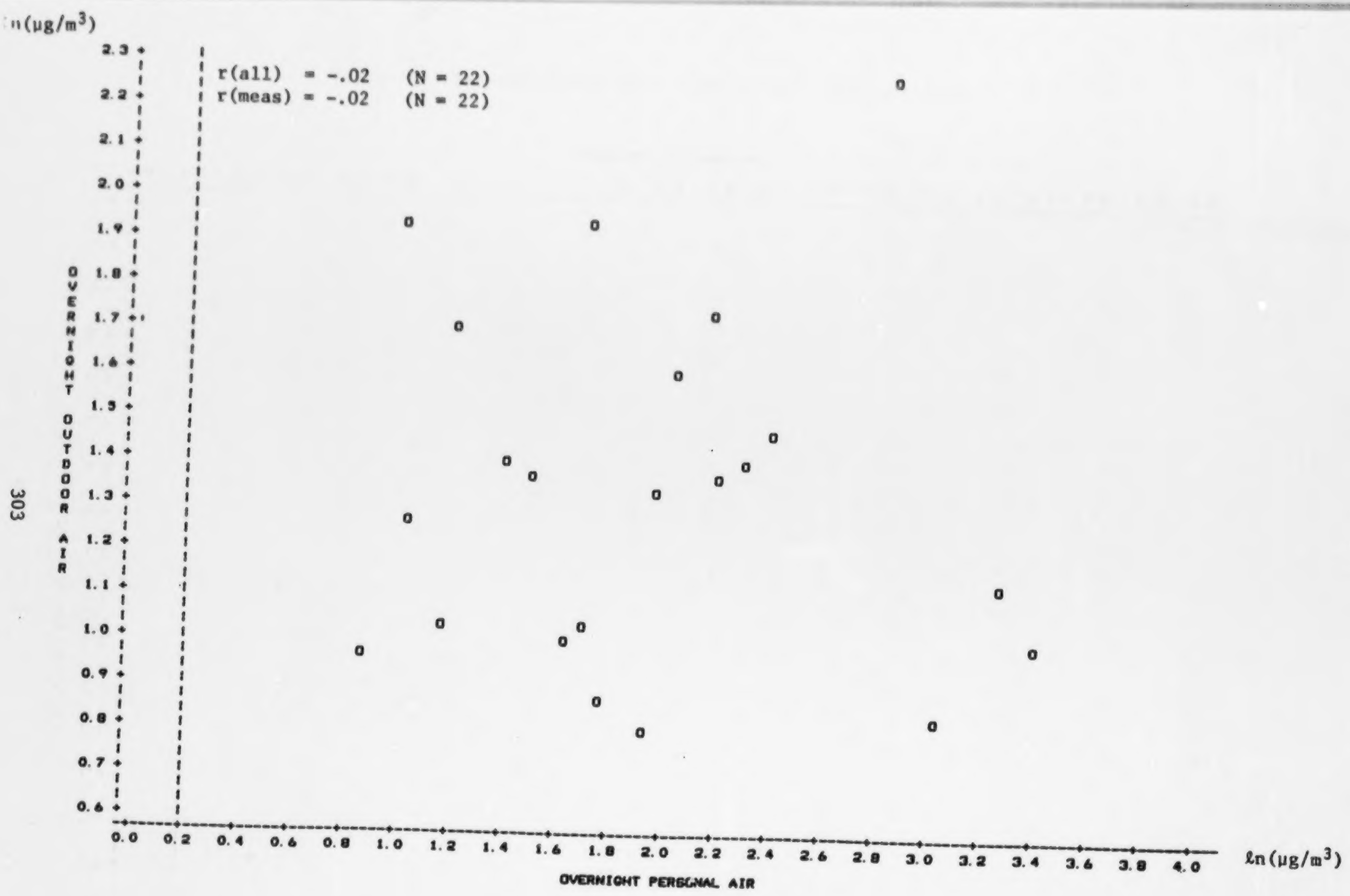


Figure 60. Benzene - Los Angeles second season.

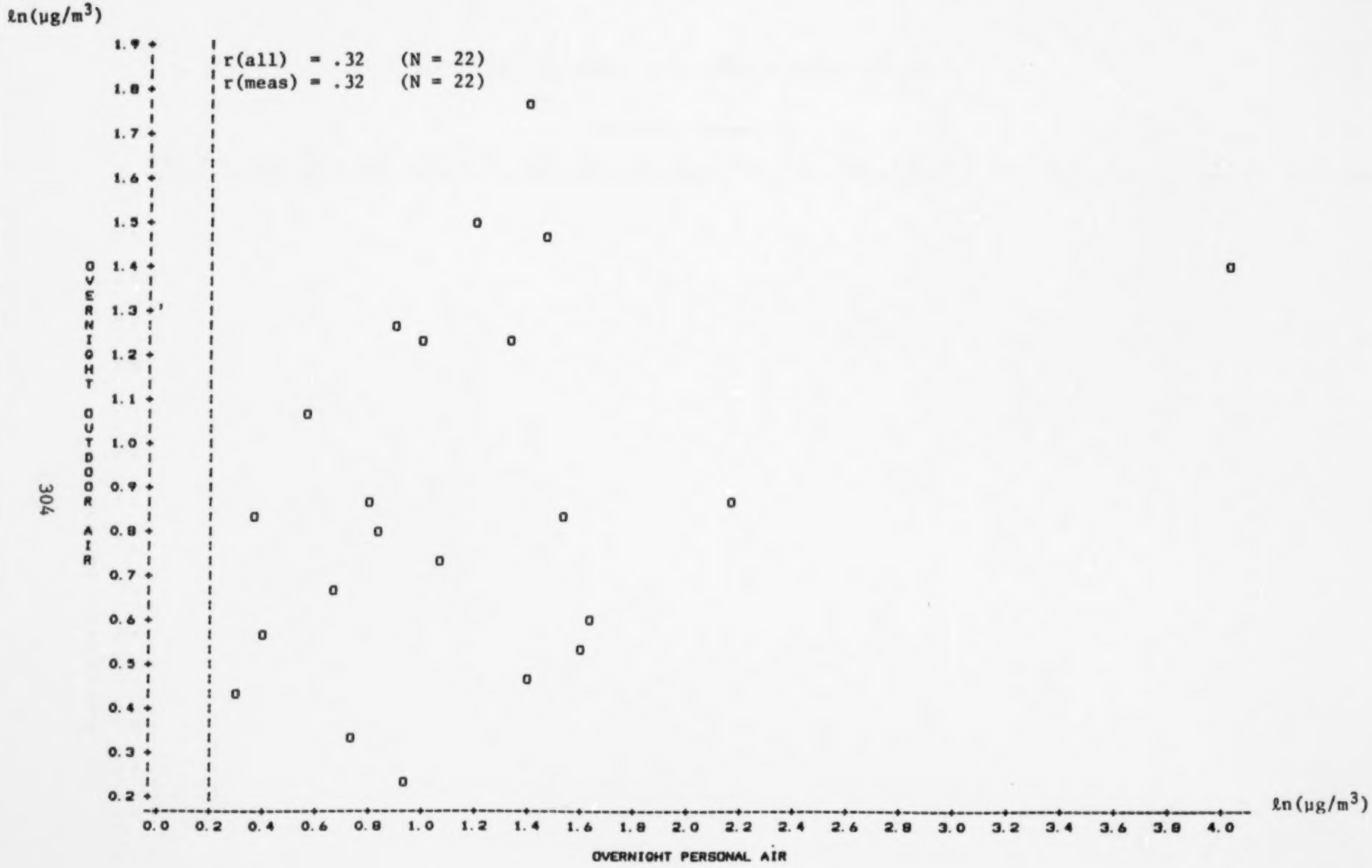


Figure 61. Tetrachloroethylene - Los Angeles second season.

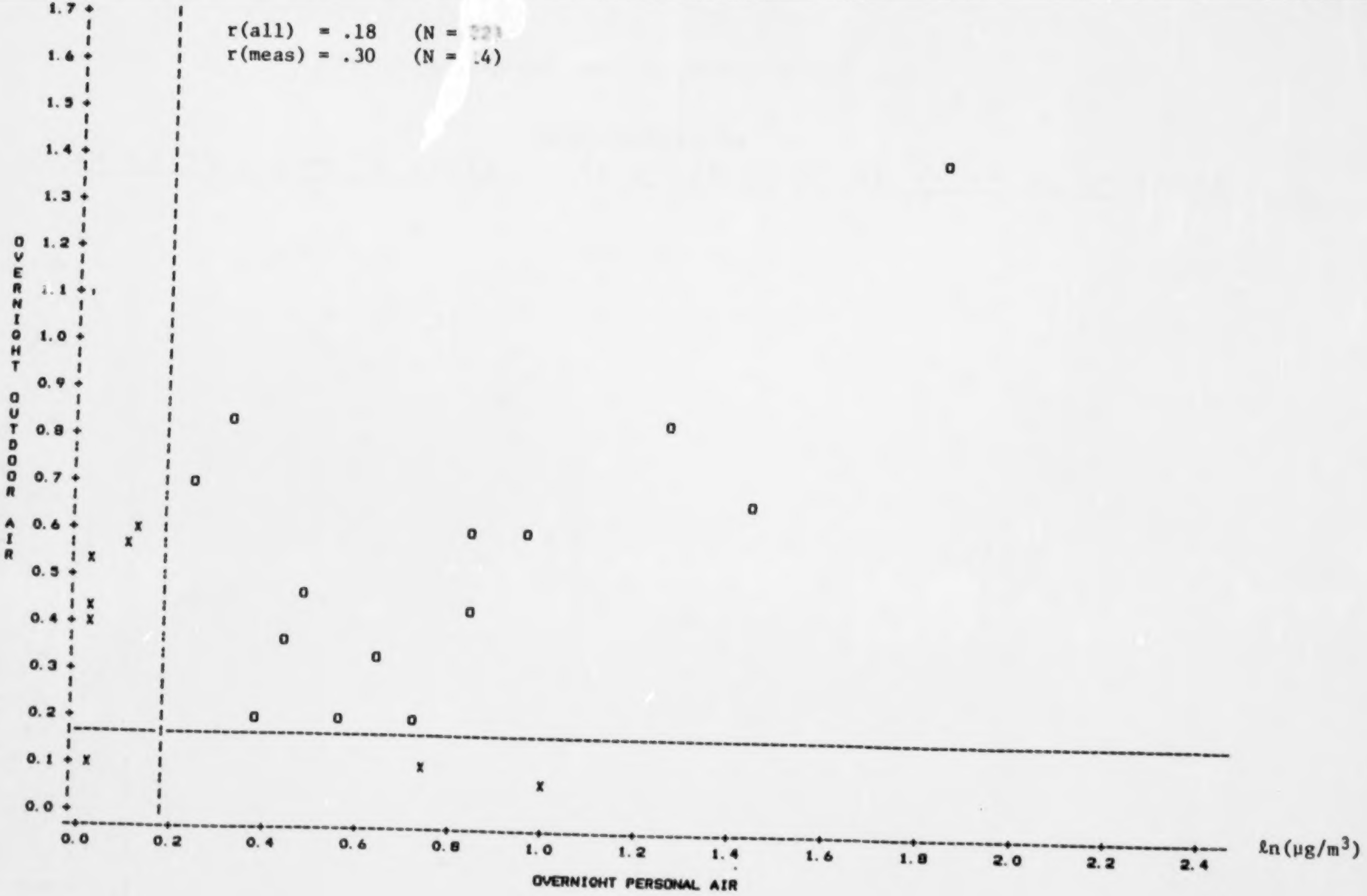


Figure 62. Styrene - Los Angeles second season.

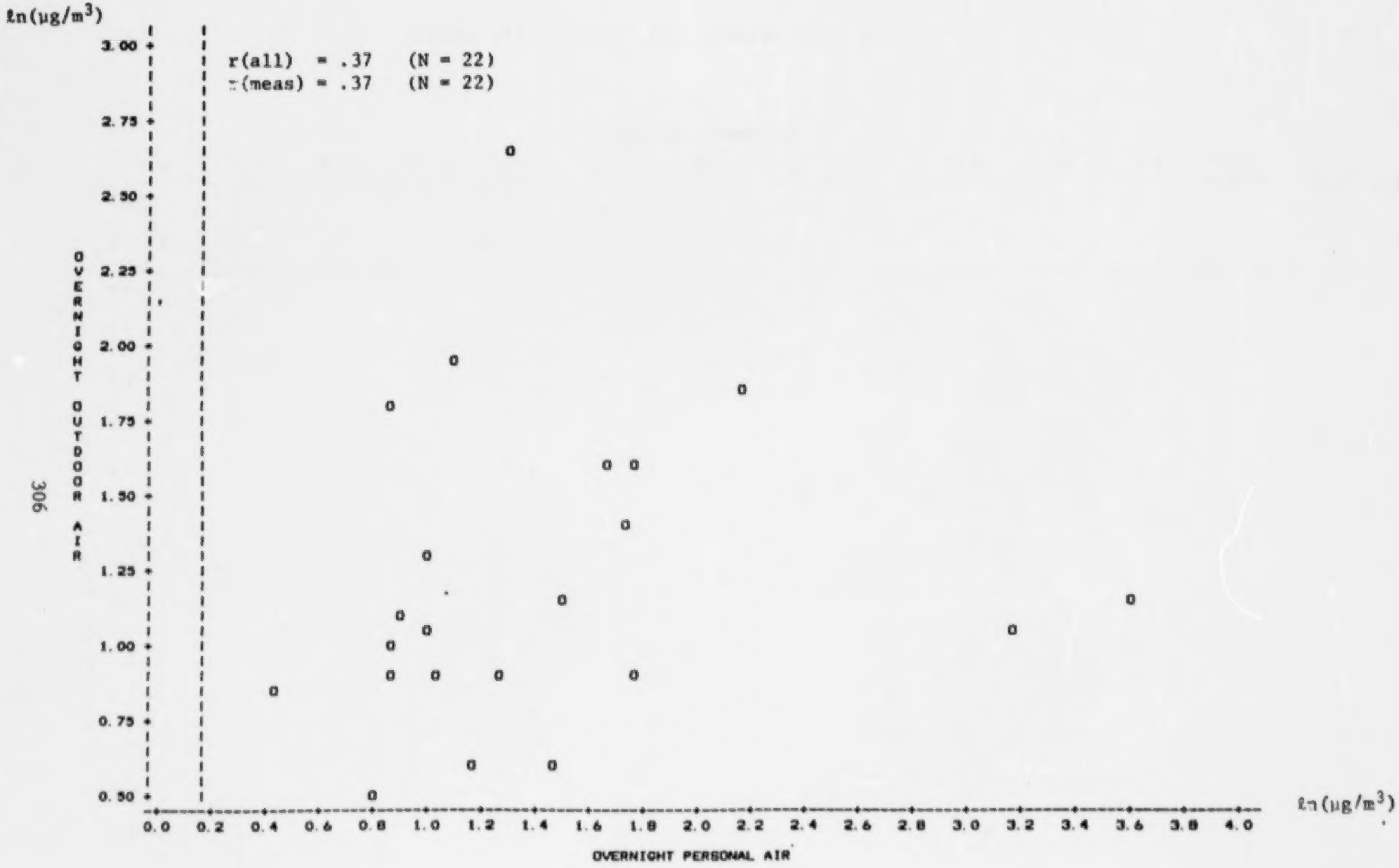


Figure 63. Ethylbenzene - Los Angeles second season.

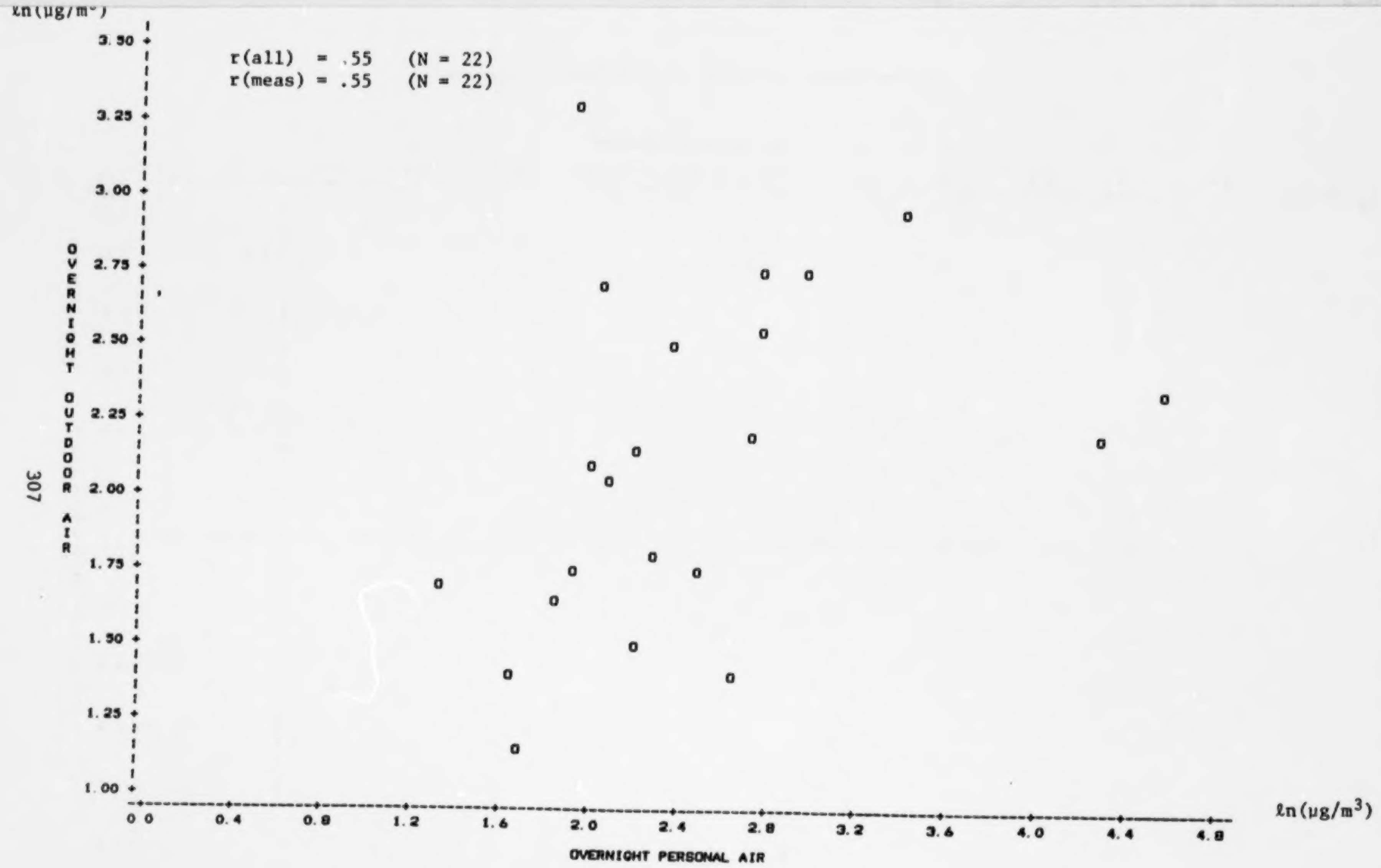


Figure 64. m,p-Xylene - Los Angeles second season.

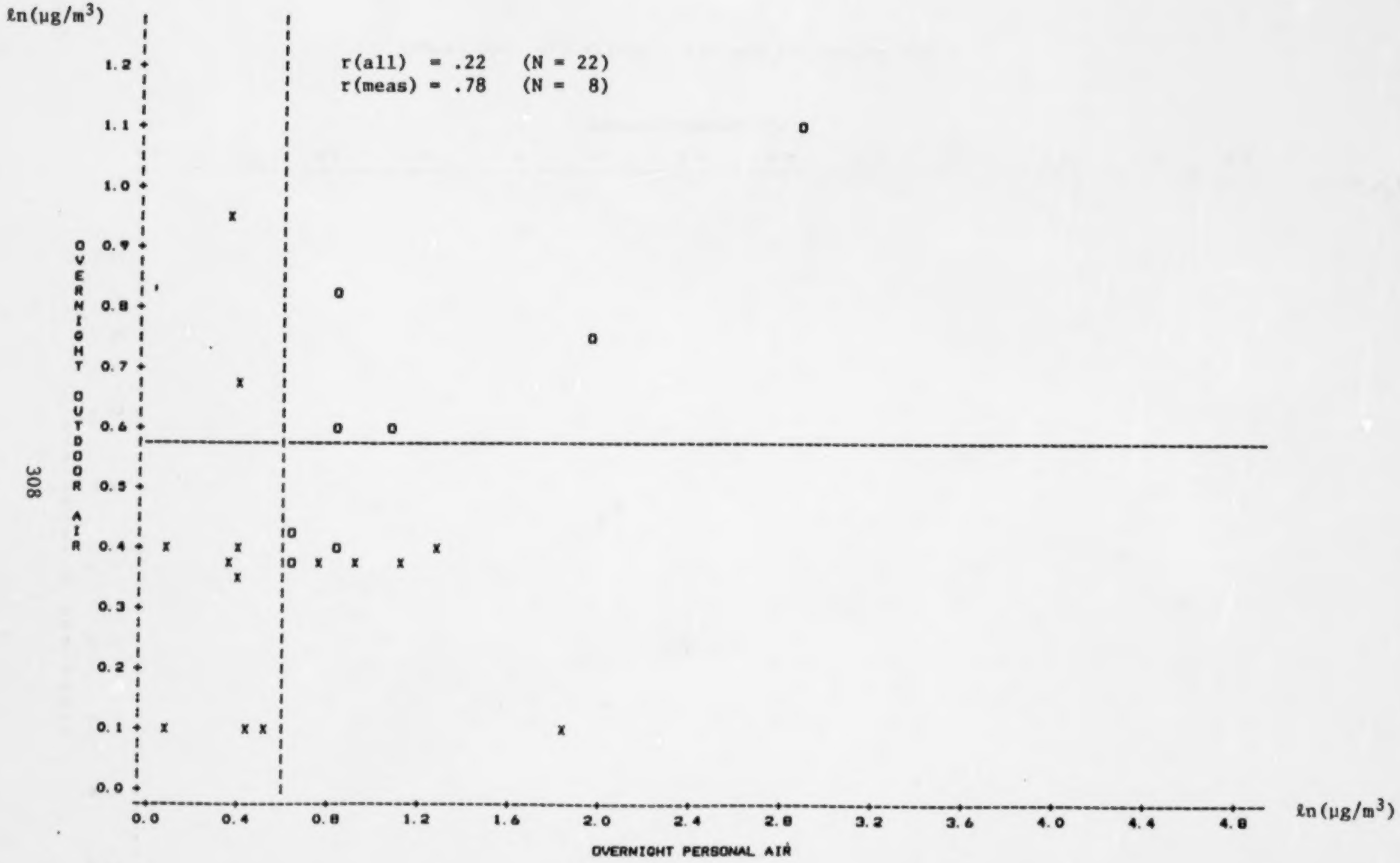
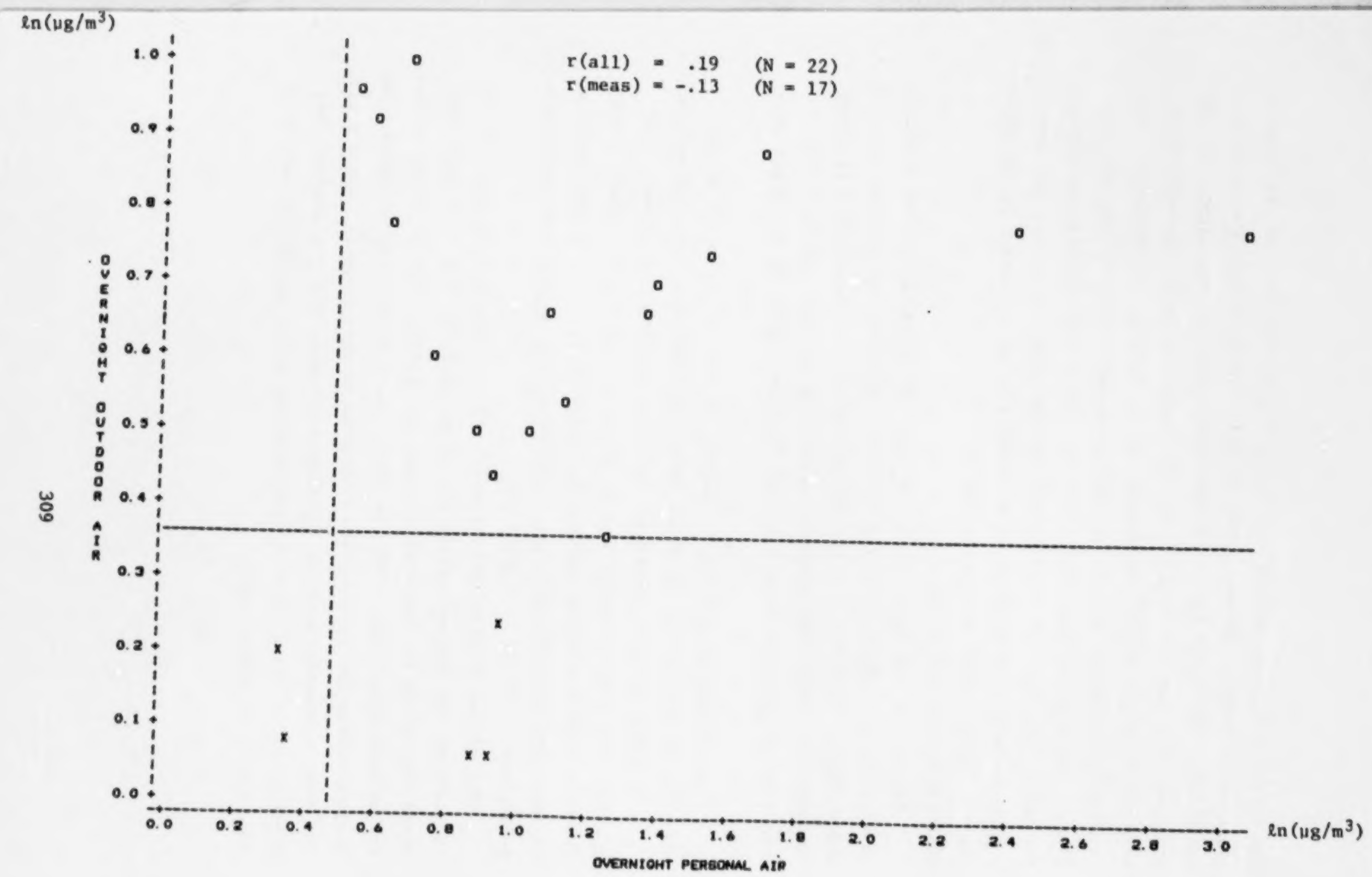


Figure 65. n-Decane - Los Angeles second season.



r(all) = .19 (N = 22)
r(meas) = -.13 (N = 17)

Figure 66. n-Octane - Los Angeles second season.

air versus overnight outdoor air for selected compounds on the natural logarithmic scale. One was added to each number before the logarithm was taken. The lines represent the median quantifiable limits for the compounds for the two media. An "O" represents both concentrations measurable, while an "X" represents one or both not measurable. The correlations for all amounts and for measurable amounts only are also given. These plots demonstrate the lack of strong correlation between the media and the wide variability in the data. However, for some compounds there was evidence of a positive trend in levels as was shown for the first season in Los Angeles.

PERSONAL VERSUS OUTDOOR AIR

Tables 138 through 140 compare overnight personal air to overnight outdoor air for those 23 people who had fixed-site air monitors outside their homes. In Table 138 the unweighted percent measurable is given for the two media. The percents measurable for chloroform, trichloroethylene and a-pinene appeared significantly higher in overnight personal air.

The unweighted arithmetic means, arithmetic standard errors, medians, and ranges are shown in Table 139. The means for chloroform, 1,1,1-trichloroethane, benzene, trichloroethylene, n-octane, and a-pinene were significantly higher in the personal air. Also, significantly higher were the medians for chloroform, 1,1,1-trichloroethane, benzene, trichloroethylene, m,p-dichlorobenzene, m,p-xylene, n-dodecane, n-dodecane, n-octane, and a-pinene.

The ratios of overnight personal air to overnight outdoor air for the medians and maximum values are shown in Table 140. For each compound the median for personal air appeared greater than or equal to that for outdoor air. Also, with the exception of carbon tetrachloride, the maximum values for personal air were greater than those for outdoor air. For some compounds such as m,p-dichlorobenzene and n-dodecane, the differences in the maximum values appeared quite large with ratios of 72.4 and 18.4, respectively.

TABLE 138. UNWEIGHTED PERCENT OF CONCENTRATIONS MEASURABLE FOR THOSE PERSONS HAVING BOTH OVERNIGHT PERSONAL AIR AND OVERNIGHT OUTDOOR AIR - LOS ANGELES SECOND SEASON

Compound	Overnight Personal Air	Overnight Outdoor Air
Chloroform	82.6*	30.4
1,2-Dichloroethane	4.35	0.00
1,1,1-Trichloroethane	100.	100.
Benzene	100.	100.
Carbon Tetrachloride	100.	100.
Trichloroethylene	69.6*	13.0
Tetrachloroethylene	100.	100.
Styrene	69.6	87.0
m,p-Dichlorobenzene	87.0	78.3
o-Dichlorobenzene	21.7	17.4
Ethylbenzene	95.6	100.
o-Xylene	100.	100.
m,p-Xylene	100.	100.
n-Decane	60.9	47.8
n-Dodecane	30.4	34.8
1,4-Dioxane	17.4	21.7
n-Octane	91.3	78.3
n-Undecane	52.2	47.8
a-Pinene	87.0*	43.5
Sample Size:	23	23

* T-test for difference between media significant at .05 level.

TABLE 139. UNWEIGHTED SUMMARY STATISTICS (μg/m³) FOR THOSE PERSONS HAVING BOTH OVERNIGHT PERSONAL AIR AND OVERNIGHT OUTDOOR AIR
LOS ANGELES SECOND SEASON

	Overnight Personal Air				Overnight Outdoor Air			
Compound	Mean	S.E.	Median	Range	Mean	S.E.	Median	Range
Chloroform	2.17*	0.87	0.82**	0.03 - 20.0	0.36	0.13	0.03	0.02 - 2.40
1,2-Dichloroethane	0.07	0.02	0.03	0.02 - 0.57	0.05	0.01	0.02	0.02 - 0.14
1,1,1-Trichloroethane	14.1*	3.95	7.90**	3.50 - 94.0	5.62	0.91	4.00	1.50 - 20.0
Benzene	7.89*	1.57	4.80**	1.40 - 29.0	3.26	0.40	2.90	1.20 - 8.50
Carbon Tetrachloride	0.67	0.03	0.71	0.38 - 1.00	0.66	0.04	0.63	0.33 - 1.10
Trichloroethylene	1.26*	0.48	0.51**	0.02 - 11.0	0.18	0.10	0.11	0.02 - 2.40
Tetrachloroethylene	4.54	2.36	1.70	0.35 - 56.0	1.77	0.26	1.30	0.25 - 4.80
Styrene	1.01	0.26	0.60	0.02 - 5.30	0.78	0.15	0.57	0.07 - 3.10
m,p-Dichlorobenzene	14.7	8.26	1.04**	0.05 - 170.	0.88	0.15	0.72	0.05 - 2.35
o-Dichlorobenzene	0.60	0.48	0.03	0.02 - 11.0	0.11	0.04	0.03	0.02 - 0.82
Ethylbenzene	4.93	1.67	2.20	0.13 - 35.0	2.93	0.55	2.00	0.63 - 13.0
o-Xylene	4.82	1.52	2.55	0.22 - 29.0	2.81	0.35	2.10	0.59 - 6.30
m,p-Xylene	15.8	4.60	8.15**	0.67 - 94.0	9.00	1.22	7.80	2.10 - 26.0
n-Decane	2.05	0.75	0.90**	0.10 - 17.0	0.71	0.12	0.48	0.10 - 2.00
n-Dodecane	3.54	2.46	0.58**	0.12 - 57.0	0.58	0.13	0.57	0.12 - 3.10
1,4-Dioxane	0.28	0.18	0.02	0.02 - 4.20	0.23	0.11	0.02	0.02 - 2.40
n-Octane	2.92*	0.88	1.60**	0.38 - 20.0	0.86	0.11	0.94	0.07 - 1.70
n-Undecane	4.57	3.26	1.00	0.10 - 76.0	1.15	0.29	0.51	0.10 - 5.90
a-Pinene	4.27*	1.43	1.40**	0.05 - 29.0	0.52	0.12	0.26	0.05 - 2.20
Sample Size Range:	23				23			

* T-test for difference in means between media significant at .05 level.

** Wilcoxon signed rank test for difference in medians significant at .05 level.

TABLE 140. SUMMARY OF MEDIANS, MAXIMUM CONCENTRATIONS AND THEIR RATIOS FOR THOSE PERSONS HAVING OVERNIGHT PERSONAL AIR AND OVERNIGHT OUTDOOR AIR - LOS ANGELES SECOND SEASON

Compound	Overnight Personal Air	Overnight Outdoor Air	Personal/ Outdoor Ratio
Chloroform **	0.82 (20.0)*	0.03 (2.40)	25.2 (8.33)
1,2-Dichloroethane	0.03 (0.57)	0.02 (0.14)	1.06 (4.15)
1,1,1-Trichloroethane **	7.90 (94.0)	4.00 (20.0)	1.98 (4.70)
Benzene **	4.80 (29.0)	2.90 (8.50)	1.66 (3.41)
Carbon Tetrachloride	0.71 (1.00)	0.63 (1.10)	1.13 (0.91)
Trichloroethylene **	0.51 (11.0)	0.11 (2.40)	4.80 (4.58)
Tetrachloroethylene	1.70 (56.0)	1.30 (4.80)	1.30 (11.7)
Styrene	0.60 (5.30)	0.57 (3.10)	1.05 (1.71)
m,p-Dichlorobenzene **	1.04 (170.)	0.72 (2.35)	1.45 (72.4)
o-Dichlorobenzene	0.03 (11.0)	0.03 (0.82)	1.00 (13.4)
Ethylbenzene	2.20 (35.0)	2.00 (13.0)	1.10 (2.69)
o-Xylene	2.55 (29.0)	2.10 (6.30)	1.21 (4.60)
m,p-Xylene **	8.15 (94.0)	7.80 (26.0)	1.04 (3.62)
n-Decane **	0.90 (17.0)	0.48 (2.00)	1.88 (8.50)
n-Dodecane **	0.58 (57.0)	0.57 (3.10)	1.01 (18.4)
1,4-Dioxane	0.02 (4.20)	0.02 (2.40)	1.02 (1.75)
n-Octane **	1.60 (20.0)	0.94 (1.70)	1.70 (11.8)
n-Undecane	1.00 (76.0)	0.51 (5.90)	1.98 (12.9)
a-Pinene **	1.40 (29.0)	0.26 (2.20)	5.46 (13.2)

* Median (Maximum)

** Wilcoxon signed rank test for difference in medians significant at .05 level.

CONTRA COSTA

In June of 1984, data was also collected on 71 people in Contra Costa County, California. A description of these people is given by the results of the Household Questionnaire (see Table 141). Slightly more than half (51%) were male. The age range was from 7 to 68 years. About 63% were employed, 11% were housewives, and 21% were students. About 31% were current smokers, 17% were former smokers and 52% had never smoked. Thirty-one listed gardening as a hobby. About 50% had central air conditioning and 97% used gas furnaces.

To gain further insight into the possible sources of exposure, a 24-hour activity screener was also administered at the end of the 24-hour study period. Table 142 summarizes the screener. The largest numbers of people were exposed to smoking (44%) and tobacco (31%), service stations and garages (27%), odorous chemicals (32%), or cleaning solutions (20%) during the 24-hour study period.

Table 143 shows the sample size ranges for Contra Costa. The variation in sample size reflects the fact that not all analysis for each compound for each media could be done on each subject. Also, outdoor fixed-sites were not set up at each home but only at one home per sample segment. The data file was created in the same manner as described for Los Angeles first season.

QUANTIFIABLE LIMITS

Tables 144 through 149 give the minimum and maximum quantifiable limits, the ratio of maximum to minimum (R1), the percentage of concentrations above the maximum quantifiable limit (max QL), the percentage measurable (percentage above the quantifiable limit), and the ratio of percent measurable to percent above the max QL (R2). Generally, there seemed to be no large differences between the minimum and maximum quantifiable limits as reflected in their ratios (R1). The largest differences appeared to be for carbon tetrachloride in breath and chlorobenzene in water with ratios of 3.03 and 3.50, respectively. This apparent lack of large variation in the quantifiable limits was also reflected in the apparent lack of large differences between the percents above max QL and percent measurable as demonstrated by their ratios (R2). The largest ratios appeared for 1,2-dibromoethane for overnight

NOTES TO TABLES

1. The terms daytime ourdoor air and overnight outdoor air refer to samples collected during the day and during the night from fixed-sites outside the participants' homes.
2. Bromodichloromethane, dibromochloromethane, and bromoform were not analyzed in air samples. Only chloroform, 1,1,1-trichloroethane, trichloroethylene, bromodichloromethane, dibromochloromethane, tetrachloroethylene, chlorobenzene, and bromoform were analyzed in water samples.
3. Sample size indicates the number of individual samples. The minimum and maximum sample sizes indicate that not all compounds always had a value for every individual sampled.
4. Duplicate measurements were averaged before the percentages were computed.
5. Measurable is defined as above the quantifiable limit. All concentration data is considered significant to two figures.
6. Contra Costa was sampled in June of 1984.
7. To calculate an estimate of the 95% confidence interval for the geometric mean, the upper limit would be (geo. mean) + 1.96 (geo. s.e.) while the upper limit would be (geo. mean) - 1.96 (geo. s.e.) where geo. mean is the geometric mean and geo. s.e. is the standard error of the geometric mean.

TABLE 141. HOUSEHOLD QUESTIONNAIRE - CONTRA COSTA

1. Sex .... Male = 36, Female = 34

2. Race

- Hispanic	5
- American Indian/Alaskan Native	2
- Black, Not Hispanic	5
- Asian/Pacific Islander	7
- White, Not Hispanic	51
- Other	0
	70

3. Age

- 7-9	4
- 10-14	8
- 15-19	4
- 21-24	5
- 25-29	15
- 30-33	10
- 35-37	5
- 40-44	9
- 45-47	4
- 54	1
- 56-59	3
- 67-68	2
	70

7. Are you presently employed? .... Yes = 44, No = 26

11. If not presently employed, which of the following best describes your status?

Housewife	8
Student	15
Unemployed	2
Retired	1
Disabled	0
	76

continued

TABLE 141 (continued)

12. Indicate whether you or any member of your household are employed in any of the listed occupations or establishments.

	You	Household Member
Painting	1	2
Dry Cleaning	1	
Chemical Plant	3	1
Petroleum Plant	3	1
Service Station/Garage/Engine Repair	2	3
Furniture Repair/Refinishing		
Plastics Manufacture or Formulation	1	1
Textile Mill		
Wood Processing Plant	1	1
Printing		1
Scientific Laboratory	1	1
Dye Plant		
Hospital		4
Metal Products		3
Battery or Electrical Components Manufacture		
Refrigerator/Air Conditioning Repair or Manufacture		
Taxi/Bus/Truck Driver	5	2
Pest Control	2	1
Drug Manufacturing or Formulation		
Photo Developing	1	
Landscaping/Gardening	1	1
None of the Above	52	47

13. Cigarette Smoking Status

Current Smoker	22
Ex-Smoker	12
Never Smoked	36
	70

14. For How Many Years Did You Smoke At Least ½ Pack of Cigarettes Per Day?

1-6	4
10-15	7
35	1
	12

15. How Long Ago Did You Quit Smoking?

1-4 years	5
6-10 years	4
15-20 years	2
	11

continued

TABLE 141 (continued)

16 a. On Average, How Many Cigarettes Do/Did You Smoke Per Day?

Less than ½ Pack	8
Between ½ and 1½ Packs	20
More Than 1½ Packs	6
	34

17. Does Anyone Else In Your Household Smoke Cigarettes?
Yes = 25, No = 44

18. Do You or Anyone Else In Your Household Smoke Cigars Or Pipes?
You ..... Yes = 0
No = 0
Anyone Else ..... Yes = 2
No = 0

19. On Average, How Many Hours Are You In The Same Room, Or Enclosed Area, With Someone Who Is Smoking? Respond For Time At Home, And Time At Work.

	At Home	At Work
0	37	35
1-5	18	12
6-10	10	7
10+	4	1
	69	55

20. Do You Or Any Member Of Your Household Pursue Any Of The Following Hobbies?

	You	Household Member
Painting	3	5
Furniture Refinishing	2	3
Scale Models	3	
Gardening	31	38
None of These	36	25

21. Do You Work With Or Use Insecticides, Pesticides, or Herbicies, As In Farming, Gardening, Or Extermination?
Yes = 17, No = 53

a. How Often Would You Say That You Work With Or Use Such Substances?

Rarely	5
Occasionally	10
Often	2
	17

b. How Often Do You Have Your House Treated For Pests?

Never	41
Monthly	1
Quarterly	8
Yearly	15
	65

continued

TABLE 141 (continued)

22. What Do You Consider Your Current Physical Condition?

Excellent	23
Good	37
Fair	8
Poor	2
	70

23. Are You Currently Taking Any Prescription Medication On A Regular Daily Basis?

Yes = 15 No = 54

24. Have You Taken Any Nonprescription Medication In The Past 48 Hours?

Yes = 29 No = 37

29. How Many Years Have You Lived In This City?

1-4	39
5-9	12
10-14	5
18-19	2
20-24	4
27-29	2
30	2
37	1
42	1
54	1
	69

30. Do You Cool Your Home With Any Of The Following Appliances?

Central Air Conditioning	42
Window Air Conditioning	7
Portable Circulating Fan	28
Ceiling Exhaust Fan	34
None of These	7

31. Do You Have Any Of The Following Appliances?

Gas Stove	10
Electric Oven	59
Gas Furnace	68
Oil Heat	0

TABLE 142. 24-HOUR SCREENER - CONTRA COSTA

---

1. Have You Pumped Your Own Gas In The Past 24 Hours?
   Yes = 16, No = 55

   a. During Which Monitoring Periods?
      Overnight = 7, Daytime = 9

2. Have You Done Your Own Dry Cleaning or Been In A Dry Cleaning Establishment During The Past 24 Hours?
   Yes = 2, No = 69

   a. During Which Monitoring Periods?
      Overnight = 0, Daytime = 2

3. Have You Smoked Cigarettes, Cigars, Or A Pipe In The Past 24 Hours?
   Yes = 22, No = 49

   a. During Which Monitoring Periods?
      Overnight = 1, Daytime = 3, Both = 18

4. Were You In An Enclosed Area With Active Smokers For More Than 15 Minutes At Any Time In The Past 24 Hours?
   Yes = 31, No = 39

   a. During Which Monitoring Periods?
      Overnight = 9, Daytime = 8, Both = 15

5. Have You Used Or Worked With Insecticides, Pesticides, Or Herbicides In Any Way In The Past 24 Hours?
   Yes = 9, No = 62

6. During This Time Of Year, On An Average Weekday Or Weekend Day, How Many Hours Per Day Are Spent:
   a. Away From Home: Weekday - 0-4 13
      5-9 25
      10-14 ... 33

      Weekend Day - 0-4 28
      5-9 27
      10-14 ... 13
      24 3

continued

TABLE 142 (continued)

7. Have You Worked At Any Of The Following Occupations Or Been In Any Of The Following Businesses During The Past Week?

	Past Week	Past 24 Hours
Painting	5	
Dry Cleaning	4	2
Chemical Plant	8	3
Petroleum Plant	4	1
Service Station/Garage/Engine Repair	37	19
Furniture Refinishing or Repair		
Plastics Manufacture or Formulation	1	1
Textile Mill		
Wood Processing Plant	1	1
Printing	1	1
Scientific Laboratory	2	
Dye Plant		
Hospital	8	4
Metal Work/Smelter	3	2
None of These	26	23

8. Have You Been Exposed To Any Of The Following During The Past Week?

	Past Week	Past 24 Hours
Solvents	13	5
Odorous Chemicals	42	23
Toxic or Hazardous Chemicals	16	5
High Dust or Particulate Levels	17	12
Auto/Truck Exhaust	35	17
Cleaning Solutions	31	14
Degreasing Compounds	9	6
Other	12	4

TABLE 143. DATA AVAILABLE FOR STATISTICAL ANALYSIS BY MEDIA CONTRA COSTA

Media	Sample Size Range
Breath	66-69
Overnight Personal Air	69-70
Daytime Personal Air	66-68
Overnight Fixed-Site Outdoor Air	10
Daytime Fixed-Site Outdoor Air	9-10
Water	71

TABLE 144. SUMMARY OF QUANTIFIABLE LIMITS AND PERCENTS MEASURABLE FOR BREATH SAMPLES (µg/m³)
CONTRA COSTA

Estimated Population Size: 90,696

	Minimum Quantifiable Limit	Maximum Quantifiable Limit	R1 Ratio Max. QL* / Min. QL**	% Above Maximum Quantifiable Limit	Percent Measurable	R2 Ratio % Measurable / % Above Max. QL
Chloroform	0.26	0.52	1.98	9.49	11.7	1.23
1,2-Dichloroethane	0.24	0.35	1.43	0.00	0.00	---
1,1,1-Trichloroethane	0.29	0.68	2.36	45.4	48.8	1.07
Benzene	0.27	0.28	1.04	77.6	81.5	1.05
Carbon Tetrachloride	0.16	0.49	3.03	6.63	13.9	2.10
Trichloroethylene	0.18	0.31	1.71	21.0	29.6	1.41
Bromodichloromethane	0.24	0.31	1.26	5.05	5.05	1.00
Dibromochloromethane	0.16	0.31	1.91	0.00	0.00	---
Tetrachloroethylene	0.26	0.28	1.07	90.6	90.6	1.00
Chlorobenzene	0.17	0.31	1.84	0.00	0.00	---
Bromoform	0.16	0.31	1.88	6.86	6.86	1.00
Styrene	0.27	0.29	1.09	59.9	63.8	1.07
m,p-Dichlorobenzene	0.34	0.56	1.66	61.0	66.6	1.09
o-Dichlorobenzene	0.16	0.31	1.91	4.68	7.11	1.52
Ethylbenzene	0.16	0.28	1.73	63.6	63.6	1.00
o-Xylene	0.16	0.31	1.98	52.4	58.3	1.11
m,p-Xylene	0.26	0.28	1.07	84.4	84.4	1.00
n-Decane	0.61	1.20	1.97	43.3	47.8	1.10
n-Dodecane	1.20	1.52	1.27	2.43	4.87	2.00
1,4-Dioxane	0.24	0.31	1.26	9.04	10.7	1.18
1,1,1,2-Tetrachloroethane	0.16	0.31	1.88	2.25	3.93	1.75
1,2-Dibromoethane	0.24	0.31	1.26	0.00	0.00	---
n-Octane	0.48	0.92	1.94	17.1	20.0	1.17
n-Undecane	0.61	1.20	1.97	33.0	41.5	1.26
1,1,2,2-Tetrachloroethane	0.26	0.31	1.19	15.9	18.1	1.14
a-Pinene	0.48	0.58	1.70	44.4	44.4	1.00

* Max QL = Maximum Quantifiable Limit
** Min QL = Minimum Quantifiable Limit

TABLE 145. SUMMARY OF QUANTIFIABLE LIMITS AND PERCENTAGES MEASURABLE FOR OVERNIGHT PERSONAL AIR SAMPLES (μg/m^3) - CONTRA COSTA

Estimated Population Size: 90,696

	Minimum Quantifiable Limit	Maximum Quantifiable Limit	R1 Ratio Max. QL* / Min. QL**	% Above Maximum Quantifiable Limit	Percent Measurable	R2 Ratio % Measurable / % Above Max. QL
Chloroform	0.19	0.25	1.31	45.8	47.7	1.04
1,2-Dichloroethane	0.12	0.24	2.01	20.1	30.0	1.49
1,1,1-Trichloroethane	---	---	---	---	100.	---
Benzene	0.22	0.22	1.00	99.4	99.4	1.00
Carbon Tetrachloride	0.24	0.27	1.13	94.1	94.1	1.00
Trichloroethylene	0.18	0.22	1.24	53.3	62.0	1.16
Tetrachloroethylene	0.20	0.22	1.12	97.5	97.5	1.00
Chlorobenzene	0.11	0.25	2.30	1.90	3.81	2.01
Styrene	0.18	0.20	1.11	87.8	89.5	1.02
m,p-Dichlorobenzene	0.24	0.40	1.68	62.6	75.1	1.20
o-Dichlorobenzene	0.12	0.25	2.07	14.9	19.3	1.30
Ethylbenzene	---	---	---	---	100.	---
o-Xylene	---	---	---	---	100.	---
m,p-Xylene	---	---	---	---	100.	---
n-Decane	0.36	0.88	2.44	42.7	79.5	1.86
n-Dodecane	0.38	1.12	2.95	28.2	62.7	2.22
1,4-Dioxane	0.12	0.25	2.07	15.0	22.4	1.49
1,1,1,2-Tetrachloroethane	0.17	0.25	1.48	1.90	3.66	1.93
1,2-Dibromoethane	0.11	0.25	2.25	0.59	2.50	4.24
n-Octane	0.39	0.68	1.74	90.2	94.4	1.05
n-Undecane	0.38	0.88	2.32	57.9	88.2	1.52
1,1,2,2-Tetrachloroethane	0.12	0.25	2.06	6.74	10.6	1.57
a-Pinene	0.35	0.48	1.37	82.2	84.7	1.03

* Max QL = Maximum Quantifiable Limit
** Min QL = Minimum Quantifiable Limit
--- 100% measurable

TABLE 146. SUMMARY OF QUANTIFIABLE LIMITS AND PERCENTS MEASURABLE FOR DAYTIME PERSONAL AIR SAMPLES (μg/m^3)
CONTRA COSTA

Estimated Population Size: 90,696

	Minimum Quantifiable Limit	Maximum Quantifiable Limit	R1 Ratio Max. QL* / Min. QL**	% Above Maximum Quantifiable Limit	Percent Measurable	R2 Ratio % Measurable / % Above Max. QL
Chloroform	0.18	0.28	1.50	33.4	34.0	1.02
1,2-Dichloroethane	0.13	0.24	1.95	7.40	25.8	3.49
1,1,1-Trichloroethane	---	---	---	---	100.	---
Benzene	---	---	---	---	100.	---
Carbon Tetrachloride	0.24	0.26	1.08	95.9	96.5	1.01
Trichloroethylene	0.12	0.22	1.83	62.2	72.2	1.16
Tetrachloroethylene	---	---	---	---	100.	---
Chlorobenzene	0.12	0.24	2.03	0.00	0.56	---
Styrene	0.18	0.20	1.13	87.4	91.3	1.04
m,p-Dichlorobenzene	0.17	0.49	2.93	58.9	74.1	1.26
o-Dichlorobenzene	0.13	0.24	1.95	11.0	13.7	1.25
Ethylbenzene	---	---	---	---	100.	---
o-Xylene	---	---	---	---	100.	---
m,p-Xylene	0.20	0.20	1.00	98.0	98.0	1.00
n-Decane	0.34	0.48	1.41	72.9	81.6	1.12
n-Dodecane	0.36	1.00	2.78	43.5	77.1	1.77
1,4-Dioxane	0.11	0.24	2.14	25.0	25.0	1.00
1,1,1,2-Tetrachloroethane	0.17	0.24	1.42	0.56	0.56	1.00
1,2-Dibromoethane	0.12	0.24	2.03	0.56	0.56	1.00
n-Octane	0.40	0.62	1.55	93.1	95.5	1.03
n-Undecane	0.36	0.48	1.33	80.7	87.4	1.08
1,1,2,2-Tetrachloroethane	0.13	0.24	1.89	5.30	5.30	1.00
a-Pinene	0.21	0.42	2.01	68.7	70.5	1.03

* Max QL = Maximum Quantifiable Limit
** Min QL = Minimum Quantifiable Limit
--- 100% measurable

TABLE 147. SUMMARY OF QUANTIFIABLE LIMITS AND PERCENTS MEASURABLE FOR OVERNIGHT OUTDOOR AIR SAMPLES ($\mu g/m^3$)
CONTRA COSTA

Estimated Population Size: 90,696

	Minimum Quantifiable Limit	Maximum Quantifiable Limit	R1 Ratio Max. QL* / Min. QL**	% Above Maximum Quantifiable Limit	Percent Measurable	R2 Ratio % Measurable / % Above Max. QL
Chloroform	0.20	0.21	1.07	79.2	79.2	1.00
1,2-Dichloroethane	0.19	0.23	1.22	0.00	0.00	---
1,1,1-Trichloroethane	---	---	---	---	100.	---
Benzene	---	---	---	---	100.	---
Carbon Tetrachloride	0.21	0.21	1.00	94.7	94.7	1.00
Trichloroethylene	0.19	0.23	1.22	7.52	7.52	1.00
Tetrachloroethylene	0.19	0.20	1.07	51.7	59.5	1.15
Chlorobenzene	0.19	0.20	1.09	18.0	18.0	1.00
Styrene	0.19	0.20	1.07	55.7	55.7	1.00
m,p-Dichlorobenzene	0.24	0.40	1.69	18.0	37.0	2.06
o-Dichlorobenzene	0.19	0.20	1.09	18.0	18.0	1.00
Ethylbenzene	0.19	0.20	1.05	70.8	70.8	1.00
o-Xylene	0.19	0.19	1.00	88.7	88.7	1.00
m,p-Xylene	---	---	---	---	100.	---
n-Decane	---	---	---	---	100.	---
n-Dodecane	0.92	1.20	1.30	0.00	0.00	---
1,4-Dioxane	0.19	0.20	1.09	18.0	18.0	1.00
1,1,1,2-Tetrachloroethane	0.19	0.20	1.09	18.0	18.0	1.00
1,2-Dibromoethane	0.19	0.23	1.23	0.00	0.00	---
n-Octane	0.56	0.64	1.14	30.3	30.3	1.00
n-Undecane	0.76	0.94	1.24	11.3	11.3	1.00
1,1,2,2-Tetrachloroethane	0.19	0.38	2.00	18.0	18.0	1.00
a-Pinene	0.38	0.40	1.06	12.7	12.7	1.00

* Max QL = Maximum Quantifiable Limit
** Min QL = Minimum Quantifiable Limit
--- 100% measurable

TABLE 148. SUMMARY OF QUANTIFIABLE LIMITS AND PERCENTS MEASURABLE FOR DAYTIME OUTDOOR AIR SAMPLES ($\mu g/m^3$)
CONTRA COSTA

Estimated Population Size: 90,696

	Minimum Quantifiable Limit	Maximum Quantifiable Limit	R1 Ratio Max. QL* / Min. QL**	% Above Maximum Quantifiable Limit	Percent Measurable	R2 Ratio % Measurable / % Above Max. QL
Chloroform	0.19	0.26	1.35	0.00	18.9	---
1,2-Dichloroethane	0.19	0.20	1.09	0.00	0.00	---
1,1,1-Trichloroethane	0.35	0.35	1.00	95.8	95.8	1.00
Benzene	---	---	---	---	100.	---
Carbon Tetrachloride	0.24	0.24	1.00	95.8	95.8	1.00
Trichloroethylene	0.12	0.21	1.81	8.03	8.03	1.00
Tetrachloroethylene	0.12	0.20	1.64	57.8	57.8	1.00
Chlorobenzene	0.18	0.21	1.14	0.00	0.00	---
Styrene	0.18	0.20	1.11	47.9	55.7	1.16
m,p-Dichlorobenzene	0.16	0.42	2.61	0.00	0.00	---
o-Dichlorobenzene	0.18	0.20	1.11	0.00	0.00	---
Ethylbenzene	0.18	0.20	1.11	65.5	65.5	1.00
o-Xylene	0.18	0.20	1.11	69.7	69.7	1.00
m,p-Xylene	---	---	---	---	100.	---
n-Decane	0.80	0.80	1.00	91.8	91.8	1.00
n-Dodecane	0.92	1.04	1.13	0.00	0.00	---
1,4-Dioxane	0.18	0.20	1.11	5.27	5.27	1.00
1,1,1,2-Tetrachloroethane	0.18	0.20	1.11	0.00	0.00	---
1,2-Dibromoethane	0.18	0.20	1.11	0.00	0.00	---
n-Octane	0.35	0.60	1.71	32.1	32.1	1.00
n-Undecane	0.73	0.84	1.15	8.03	8.03	1.00
1,1,2,2-Tetrachloroethane	0.18	0.20	1.11	0.00	0.00	---
a-Pinene	0.37	0.40	1.09	0.00	0.00	---

* Max QL = Maximum Quantifiable Limit
** Min QL = Minimum Quantifiable Limit
--- 100% measurable

TABLE 149. SUMMARY OF QUANTIFIABLE LIMITS AND PERCENTS MEASURABLE FOR WATER SAMPLES (ng/mL)
CONTRA COSTA

Estimated Population Size: 90,696

	Minimum Quantifiable Limit	Maximum Quantifiable Limit	R1 Ratio Max. QL* / Min. QL**	% Above Maximum Quantifiable Limit	Percent Measurable	R2 Ratio % Measurable / % Above Max. QL
Chloroform	1.50	1.50	1.00	94.3	94.3	1.00
1,1,1-Trichloroethane	0.05	0.05	1.00	10.4	10.4	1.00
Trichloroethylene	0.05	0.05	1.00	50.4	66.0	1.31
Bromodichloromethane	0.30	0.30	1.00	94.3	96.2	1.02
Dibromochloromethane	0.30	0.30	1.00	84.9	84.9	1.00
Tetrachloroethylene	0.05	0.05	1.00	93.6	93.6	1.00
Chlorobenzene	0.05	0.18	3.50	3.37	5.84	1.73
Bromoform	0.30	0.30	1.00	67.2	69.2	1.03

* Max QL = Maximum Quantifiable Limit

** Min QL = Minimum Quantifiable Limit

personal air and 1,2-dichloroethane for daytime personal air with ratios of 4.24 and 3.49, respectively.

PERCENT MEASURABLE

Table 150 gives the percents measurable by media. Benzene, tetrachloroethylene, styrene, ethylbenzene, o-xylene and m,p-xylene were more than 50% measurable for breath and air, while chlorobenzene, o-dichlorobenzene, 1,1,1,2-tetrachloroethane, 1,2-dibromoethane, and 1,1,2,2-tetrachloroethane were less than 20% measurable. For water, chloroform, trichloroethylene, bromodichloromethane, dibromochloromethane, tetrachloroethylene, and bromoform were over 65% measurable.

WEIGHTED SUMMARY STATISTICS

Weighted summary statistics are given in Tables 151 through 156 for those compounds examined in the Los Angeles studies. The statistics include arithmetic mean and standard error, geometric mean and standard error, median, percentiles, and range. Overall, the arithmetic means appeared greater than the medians and geometric means. This was presumably caused in part by large outliers resulting in skewed frequency distributions. Compounds showing apparently high concentrations were 1,1,1-trichloroethane, benzene, tetrachloroethylene, and m,p-dichlorobenzene for breath; for overnight personal air, 1,1,1-trichloroethane, benzene, m,p-dichlorobenzene, and m,p-xylene; for daytime outdoor air, 1,1,1-trichloroethane, benzene, and m,p-xylene; and for overnight and daytime outdoor air, 1,1,1-trichloroethane, benzene, m,p-xylene and n-decane. For water chloroform, bromodichloromethane, and dibromochloromethane had apparently high concentration levels.

The medians for breath, daytime personal air, and daytime outdoor air are compared in Table 157. With the exception of n-decane, the medians for daytime personal air were about the same or larger than those for daytime outdoor air. For tetrachloroethylene, o-xylene, n-undecane, and a-pinene the medians for personal air appeared particularly large in comparison, as shown by their ratios. In comparing daytime outdoor air to breath, the medians for breath appeared about the same or larger for most compounds. The exceptions were 1,1,1-trichloroethane, carbon tetrachloride, and n-decane.

TABLE 150. WEIGHTED PERCENT MEASURABLE BY MEDIA - CONTRA COSTA

Population Estimate: 90,696

	Breath	Overnight Personal Air	Daytime Personal Air	Overnight Outdoor Air	Daytime Outdoor Air	Water
Chloroform	11.7	47.7	34.0	79.2	18.9	94.3
1,2-Dichloroethane	0.00	30.0	25.8	0.00	0.00	---
1,1,1-Trichloroethane	48.8	100.	100.	100.	95.8	10.4
Benzene	81.5	99.4	100.	100.	100.	---
Carbon Tetrachloride	13.9	94.1	96.5	94.7	95.8	---
Trichloroethylene	29.6	62.0	72.2	7.52	8.03	66.0
Bromodichloromethane	5.05	---	---	---	---	96.2
Dibromochloromethane	0.00	---	---	---	---	84.9
Tetrachloroethylene	90.6	97.5	100.	59.5	57.8	93.6
Chlorobenzene	0.00	3.81	0.56	18.0	0.00	5.84
Bromoform	6.86	---	---	---	---	69.2
Styrene	63.8	89.5	91.3	55.7	55.7	---
m,p-Dichlorobenzene	66.6	75.1	74.1	37.0	0.00	---
o-Dichlorobenzene	7.11	19.3	13.7	18.0	0.00	---
Ethylbenzene	63.6	100.	100.	70.8	65.5	---
o-Xylene	58.3	100.	100.	88.7	69.7	---
m,p-Xylene	84.4	100.	98.0	100.	100.	---
n-Decane	47.8	79.5	81.6	100.	91.8	---
n-Dodecane	4.87	62.7	77.1	0.00	0.00	---
1,4-Dioxane	10.7	22.4	25.0	18.0	5.27	---
1,1,1,2-Tetrachloroethane	3.93	3.66	0.56	18.0	0.00	---
1,2-Dibromoethane	0.00	2.50	0.56	0.00	0.00	---
n-Octane	20.0	94.4	95.5	30.3	32.1	---
n-Undecane	41.5	88.2	87.4	11.3	8.03	---
1,1,2,2-Tetrachloroethane	18.1	10.6	5.30	18.0	0.00	---
a-Pinene	44.4	84.7	70.5	12.7	0.00	---
Sample Size Range:	66-69	68-70	66-68	10	9-10	71

--- Not analyzed in this media.

TABLE 151. WEIGHTED SUMMARY STATISTICS FOR SELECTED COMPOUNDS FOR BREATH ($\mu g/m^3$) - CONTRA COSTA

Estimated Population: 90,696
Sample Size Range: 66-68

Compound	a/ Mid. Q.L.	Arith. Mean	b/ Arith. S.E.	c/ Geo. Mean	d/ Geo. S.E.	Percentiles 16	25	Med.	75	84	90	95	Range
Chloroform	0.33	0.42	0.24	0.07	0.01	0.04	0.04	0.04	0.06	0.17	0.31	1.30	0.03 - 13.0
1,2-Dichloroethane	0.27	0.04	0.00	0.03	0.00	0.03	0.03	0.03	0.04	0.04	0.04	0.04	0.03 - 0.04
1,1,1-Trichloroethane	0.48	27.1	17.5	0.57	0.24	0.06	0.06	0.09	5.90	9.90	13.0	45.0	0.04 - 750.
Benzene	0.27	6.99	1.65	1.67	0.58	0.18	0.41	1.80	11.0	16.0	20.0	30.0	0.03 - 48.0
Carbon Tetrachloride	0.34	0.23	0.03	0.17	0.02	0.05	0.17	0.20	0.26	0.30	0.35	0.52	0.03 - 1.30
Trichloroethylene	0.27	0.60	0.29	0.14	0.02	0.03	0.03	0.17	0.28	0.49	1.00	2.00	0.03 - 14.0
Tetrachloroethylene	0.27	13.4	6.57	1.77	0.31	0.45	0.65	2.00	4.30	7.10	16.0	68.0	0.03 - 330.
Styrene	0.27	0.67	0.11	0.32	0.07	0.03	0.17	0.49	0.75	1.25	2.00	2.30	0.03 - 4.00
m,p-Dichlorobenzene	0.35	3.73	1.41	0.86	0.18	0.21	0.21	0.86	2.17	2.67	11.6	29.1	0.07 - 39.3
o-Dichlorobenzene	0.27	0.08	0.02	0.05	0.00	0.03	0.03	0.03	0.03	0.10	0.18	0.27	0.03 - 1.00
Ethylbenzene	0.27	1.16	0.31	0.46	0.13	0.17	0.17	0.44	1.30	1.60	2.90	4.50	0.03 - 25.0
o-Xylene	0.27	0.65	0.16	0.32	0.08	0.04	0.17	0.36	0.80	1.30	1.40	1.85	0.03 - 5.90
m,p-Xylene	0.27	2.46	0.65	0.98	0.30	0.30	0.37	1.10	2.80	4.00	5.40	8.80	0.03 - 56.0
n-Decane	1.10	1.33	0.20	0.83	0.13	0.14	0.69	0.69	1.80	2.50	3.00	4.10	0.14 - 5.40
n-Dodecane	1.32	0.38	0.09	0.24	0.02	0.17	0.17	0.17	0.18	0.81	0.81	0.88	0.15 - 3.70
1,4-Dioxane	0.27	0.15	0.05	0.05	0.01	0.03	0.03	0.03	0.04	0.17	0.18	1.30	0.03 - 1.60
n-Octane	0.80	0.57	0.14	0.31	0.07	0.10	0.10	0.50	0.54	0.96	1.20	2.05	0.09 - 6.60
n-Undecane	1.10	1.18	0.15	0.72	0.06	0.14	0.38	0.69	1.70	2.40	2.70	3.80	0.14 - 5.40
a-Pinene	0.53	1.32	0.38	0.50	0.07	0.07	0.33	0.33	1.20	1.40	2.10	4.50	0.07 - 14.0

a/ Mid. Q.L. = Median Quantifiable Limit
b/ Arith. S.E. = Standard Error of Arithmetic Mean
c/ Geo. Mean = Geometric Mean
d/ Geo. S.E. = Standard Error of Geometric Mean

TABLE 152. WEIGHTED SUMMARY STATISTICS FOR SELECTED COMPOUNDS FOR OVERNIGHT PERSONAL AIR ($\mu g/m^3$) - CONTRA COSTA

Estimated Population: 90,696
Sample Size Range: 68-70

	a/ Mid. Q.L.	Arith. Mean	b/ Arith. S.E.	c/ Geo. Mean	d/ Geo. S.E.	Percentiles							Range
						16	25	Med.	75	84	90	95	
Chloroform	0.22	0.80	0.19	0.17	0.05	0.03	0.03	0.03	0.98	2.10	2.40	2.70	0.02 - 6.30
1,2-Dichloroethane	0.20	0.15	0.01	0.11	0.01	0.03	0.12	0.13	0.16	0.30	0.31	0.38	0.02 - 0.54
1,1,1-Trichloroethane	e/	6.32	1.03	4.41	0.66	1.90	2.30	4.30	8.80	10.0	12.0	16.0	0.35 - 40.0
Benzene	0.22	6.47	1.13	4.63	0.68	2.30	2.90	4.40	7.50	9.30	16.0	18.0	0.14 - 32.0
Carbon Tetrachloride	0.26	1.37	0.34	0.87	0.15	0.54	0.60	0.71	1.60	2.40	3.80	5.50	0.03 - 7.60
Trichloroethylene	0.20	0.76	0.12	0.33	0.05	0.12	0.13	0.25	0.98	1.20	2.10	2.80	0.02 - 6.40
Tetrachloroethylene	0.20	3.36	0.67	1.76	0.30	0.58	0.72	1.80	3.90	6.90	8.50	12.0	0.03 - 21.0
Styrene	0.20	0.89	0.13	0.55	0.10	0.23	0.33	0.71	1.30	1.60	2.00	2.40	0.02 - 4.10
m,p-Dichlorobenzene	0.25	7.23	3.40	0.92	0.25	0.16	0.25	0.53	2.99	4.45	8.35	46.0	0.05 - 151.
o-Dichlorobenzene	0.20	0.14	0.07	0.05	0.01	0.02	0.02	0.03	0.08	0.24	0.40	0.70	0.02 - 1.60
Ethylbenzene	e/	2.91	0.76	1.92	0.31	0.99	1.10	1.90	3.30	4.00	6.50	9.40	0.17 - 28.0
o-Xylene	e/	3.71	1.03	2.47	0.43	1.30	1.50	2.20	3.90	5.45	7.10	11.0	0.29 - 35.0
m,p-Xylene	e/	9.34	2.18	6.73	1.09	3.50	4.10	6.10	11.0	14.0	18.0	26.0	1.00 - 68.0
n-Decane	0.40	1.74	0.51	0.84	0.12	0.25	0.44	0.71	1.40	1.80	2.60	4.70	0.11 - 26.0
n-Dodecane	0.40	1.27	0.23	0.69	0.10	0.24	0.25	0.63	1.41	2.10	3.70	4.60	0.05 - 9.70
1,4-Dioxane	0.20	0.15	0.03	0.06	0.01	0.02	0.02	0.03	0.13	0.24	0.36	0.53	0.02 - 2.90
n-Octane	0.40	2.07	0.27	1.50	0.21	0.84	1.00	1.60	2.40	3.35	3.60	5.80	0.05 - 9.40
n-Undecane	0.40	2.02	0.39	1.17	0.15	0.51	0.64	1.10	2.20	2.90	4.40	7.70	0.11 - 16.0
a-Pinene	0.39	2.11	0.35	1.23	0.16	0.40	0.79	1.40	2.15	2.90	5.60	6.60	0.05 - 13.0

a/ Mid. Q.L. = Median Quantifiable Limit
b/ Arith. S.E. = Standard Error of Arithmetic Mean
c/ Geo. Mean = Geometric Mean
d/ Geo. S.E. = Standard Error of Geometric Mean
e/ 100% measurable

TABLE 153. WEIGHTED SUMMARY STATISTICS FOR SELECTED COMPOUNDS FOR DAYTIME PERSONAL AIR ($\mu g/m^3$) - CONTRA COSTA

Estimated Population: 90,696
Sample Size Range: 66-68

	a/ Mid. Q.L.	Arith. Mean	b/ Arith. S.E.	c/ Geo. Mean	d/ Geo. S.E.	Percentiles							Range
						16	25	Med.	75	84	90	95	
Chloroform	0.22	0.47	0.14	0.10	0.03	0.03	0.03	0.03	0.45	1.30	1.67	2.60	0.02 - 4.15
1,2-Dichloroethane	0.20	0.12	0.01	0.09	0.01	0.03	0.03	0.13	0.14	0.20	0.24	0.29	0.02 - 0.54
1,1,1-Trichloroethane	e/	26.2	12.1	7.92	0.94	2.65	3.10	5.50	17.0	31.0	38.0	66.0	0.96 - 620.
Benzene	e/	8.47	0.87	6.83	0.73	3.90	4.50	6.30	11.0	15.0	17.0	21.0	0.72 - 25.0
Carbon Tetrachloride	0.24	1.23	0.20	0.94	0.12	0.52	0.63	0.80	1.50	2.00	2.95	3.40	0.15 - 5.70
Trichloroethylene	0.20	6.81	4.57	0.59	0.14	0.12	0.13	0.50	1.05	3.50	10.0	26.0	0.02 - 210.
Tetrachloroethylene	e/	7.82	3.82	2.44	0.27	0.98	1.20	2.20	5.10	6.80	9.20	18.0	0.31 - 200.
Styrene	0.19	1.04	0.08	0.69	0.10	0.23	0.47	0.83	1.30	1.60	2.00	2.05	0.03 - 7.90
m,p-Dichlorobenzene	0.26	3.88	1.17	0.89	0.22	0.16	0.19	0.91	2.55	3.20	8.75	24.5	0.05 - 68.1
o-Dichlorobenzene	0.20	1.02	0.96	0.05	0.01	0.02	0.02	0.03	0.08	0.13	0.30	0.35	0.02 - 50.0
Ethylbenzene	e/	4.55	0.69	3.02	0.41	1.40	1.80	2.90	4.80	7.30	10.0	14.0	0.27 - 37.0
o-Xylene	e/	5.02	0.88	3.58	0.53	1.80	2.20	3.60	6.45	7.60	11.0	15.0	0.41 - 31.0
m,p-Xylene	0.20	12.9	1.83	8.73	1.61	5.00	6.00	10.0	15.5	20.2	27.0	34.0	0.03 - 66.0
n-Decane	0.39	2.22	0.49	1.05	0.18	0.26	0.44	1.00	1.90	3.20	4.00	10.0	0.21 - 32.0
n-Dodecane	0.40	2.87	0.76	0.92	0.14	0.26	0.42	0.95	1.50	3.60	6.10	11.0	0.05 - 85.0
1,4-Dioxane	0.20	6.23	6.43	0.08	0.01	0.02	0.02	0.07	0.25	0.27	0.52	0.71	0.02 - 290.
n-Octane	0.40	2.51	0.38	1.80	0.27	0.78	1.20	2.30	3.20	3.70	4.40	5.40	0.05 - 18.0
n-Undecane	0.39	3.41	0.85	1.43	0.20	0.41	0.74	1.30	2.30	3.60	8.90	14.0	0.23 - 100.
a-Pinene	0.39	2.09	0.26	0.88	0.08	0.24	0.24	0.95	2.30	3.10	4.70	7.00	0.05 - 30.0

a/ Mid. Q.L. = Median Quantifiable Limit
b/ Arith. S.E. = Standard Error of Arithmetic Mean
c/ Geo. Mean = Geometric Mean
d/ Geo. S.E. = Standard Error of Geometric Mean
e/ 100% measurable

TABLE 154. WEIGHTED SUMMARY STATISTICS FOR SELECTED COMPOUNDS FOR OVERNIGHT OUTDOOR AIR ($\mu g/m^3$) - CONTRA COSTA

Estimated Population: 90,696
Sample Size Range: 10

	a/ Mid. Q.L.	Arith. Mean	b/ Arith. S.E.	c/ Geo. Mean	d/ Geo. S.E.	Percentiles 16	25	Med.	75	84	90	Range
Chloroform	0.21	0.59	0.15	0.39	0.13	0.13	0.21	0.62	0.80	1.01	1.01	0.02 - 1.50
1,2-Dichloroethane	0.19	0.06	0.02	0.04	0.01	0.02	0.02	0.03	0.12	0.12	0.14	0.02 - 0.14
1,1,1-Trichloroethane	e/	2.78	0.62	2.40	0.37	1.60	1.80	2.10	2.40	3.90	3.90	1.60 - 9.60
Benzene	e/	1.82	0.32	1.65	0.27	1.00	1.40	1.70	1.90	3.20	3.20	0.88 - 3.60
Carbon Tetrachloride	0.21	0.47	0.14	0.38	0.07	0.26	0.29	0.33	0.46	0.47	0.47	0.13 - 2.00
Trichloroethylene	0.19	0.12	0.02	0.09	0.03	0.02	0.12	0.12	0.13	0.14	0.14	0.02 - 0.31
Tetrachloroethylene	0.19	0.62	0.40	0.16	0.09	0.03	0.03	0.25	0.36	0.61	0.61	0.02 - 5.60
Styrene	0.20	0.54	0.25	0.19	0.13	0.03	0.03	0.23	0.80	1.20	1.90	0.02 - 1.90
m,p-Dichlorobenzene	0.38	0.37	0.11	0.31	0.07	0.24	0.24	0.25	0.40	0.51	1.05	0.15 - 1.05
o-Dichlorobenzene	0.19	0.12	0.07	0.05	0.02	0.02	0.02	0.03	0.12	0.24	0.58	0.02 - 0.58
Ethylbenzene	0.20	0.65	0.21	0.46	0.17	0.13	0.13	0.66	0.79	1.00	1.60	0.12 - 1.60
o-Xylene	0.19	0.52	0.18	0.34	0.14	0.21	0.21	0.39	0.55	0.84	1.50	0.02 - 1.50
m,p-Xylene	e/	1.59	0.47	1.22	0.37	0.54	0.72	1.30	1.90	3.10	3.80	0.35 - 3.80
n-Decane	e/	2.75	0.76	2.32	0.52	1.80	1.80	1.90	2.85	4.90	7.00	1.10 - 7.00
n-Dodecane	0.96	0.20	0.08	0.15	0.04	0.12	0.12	0.12	0.13	0.13	0.75	0.12 - 0.75
1,4-Dioxane	0.19	0.15	0.08	0.06	0.03	0.02	0.02	0.03	0.12	0.53	0.53	0.02 - 0.85
n-Octane	0.60	0.56	0.22	0.34	0.12	0.08	0.08	0.36	0.73	0.87	1.90	0.07 - 1.90
n-Undecane	0.80	0.39	0.18	0.22	0.09	0.10	0.10	0.10	0.51	0.59	1.60	0.10 - 1.60
a-Pinene	0.39	0.14	0.09	0.07	0.02	0.05	0.05	0.05	0.05	0.05	0.75	0.05 - 0.75

a/ Mid. Q.L. = Median Quantifiable Limit
b/ Arith. S.E. = Standard Error of Arithmetic Mean
c/ Geo. Mean = Geometric Mean
d/ Geo. S.E. = Standard Error of Geometric Mean
e/ 100% measurable

TABLE 155. WEIGHTED SUMMARY STATISTICS FOR SELECTED COMPOUNDS FOR DAYTIME OUTDOOR AIR ($\mu g/m^3$) - CONTRA COSTA

Estimated Population: 90,696
Sample Size Range: 9-10

	a/ Mid. Q.L.	Arith. Mean	b/ Arith. S.E.	c/ Geo. Mean	d/ Geo. S.E.	Percentiles 16	25	Med.	75	84	90	Range
Chloroform	0.21	0.06	0.03	0.04	0.01	0.02	0.02	0.03	0.03	0.18	0.23	0.02 - 0.23
1,2-Dichloroethane	0.20	0.04	0.02	0.03	0.01	0.02	0.02	0.03	0.03	0.12	0.12	0.02 - 0.12
1,1,1-Trichloroethane	0.35	2.90	0.53	2.36	0.49	1.40	1.50	2.20	4.70	4.70	5.40	0.22 - 5.40
Benzene	e/	1.99	0.63	1.49	0.33	0.91	0.99	1.30	1.60	3.30	6.30	0.54 - 6.30
Carbon Tetrachloride	0.24	0.42	0.06	0.39	0.04	0.27	0.30	0.38	0.52	0.52	0.52	0.15 - 1.00
Trichloroethylene	0.19	0.10	0.02	0.08	0.02	0.03	0.03	0.11	0.12	0.13	0.13	0.02 - 0.29
Tetrachloroethylene	0.18	0.62	0.27	0.21	0.14	0.02	0.03	0.24	0.59	1.90	1.90	0.02 - 2.70
Styrene	0.20	0.34	0.13	0.13	0.08	0.02	0.02	0.18	0.65	0.74	0.85	0.02 - 0.85
m,p-Dichlorobenzene	0.37	0.15	0.04	0.12	0.04	0.05	0.05	0.15	0.24	0.24	0.26	0.05 - 0.26
o-Dichlorobenzene	0.20	0.02	0.00	0.02	0.00	0.02	0.02	0.02	0.03	0.03	0.03	0.02 - 0.03
Ethylbenzene	0.18	1.10	0.57	0.46	0.22	0.11	0.13	0.40	1.20	1.20	1.20	0.11 - 7.60
o-Xylene	0.18	0.83	0.41	0.40	0.17	0.11	0.13	0.37	0.98	1.20	1.20	0.11 - 5.40
m,p-Xylene	e/	2.87	1.48	1.33	0.56	0.41	0.41	1.20	2.90	3.30	3.30	0.41 - 20.0
n-Decane	0.80	4.82	1.98	2.65	1.11	1.10	2.10	3.40	4.50	4.60	4.60	0.10 - 26.0
n-Dodecane	0.96	0.16	0.04	0.14	0.02	0.12	0.12	0.12	0.13	0.13	0.13	0.12 - 0.61
1,4-Dioxane	0.19	0.05	0.02	0.03	0.01	0.02	0.02	0.02	0.03	0.12	0.12	0.02 - 0.26
n-Octane	0.58	0.40	0.16	0.23	0.11	0.07	0.08	0.22	0.62	1.00	1.10	0.07 - 1.10
n-Undecane	0.78	0.44	0.18	0.26	0.10	0.10	0.10	0.46	0.47	0.49	0.49	0.10 - 2.20
a-Pinene	0.39	0.07	0.03	0.06	0.01	0.05	0.05	0.05	0.05	0.05	0.24	0.05 - 0.24

a/ Mid. Q.L. = Median Quantifiable Limit
b/ Arith. S.E. = Standard Error of Arithmetic Mean
c/ Geo. Mean = Geometric Mean
d/ Geo. S.E. = Standard Error of Geometric Mean
e/ 100% measurable

TABLE 156. WEIGHTED SUMMARY STATISTICS FOR SELECTED COMPOUNDS FOR WATER (ng/mL) - CONTRA COSTA

Estimated Population: 90,696
Sample Size Range: 71

	a/ Mid. Q.L.	Arith. Mean	b/ Arith. S.E.	c/ Geo. Mean	d/ Geo. S.E.	Percentiles							Range
						16	25	Med.	75	84	90	95	
Chloroform	1.50	42.5	3.10	25.6	4.79	5.60	12.7	48.9	65.1	71.8	76.6	90.6	0.94 - 99.4
1,1,1-Trichloroethane	0.05	0.09	0.04	0.04	0.00	0.03	0.03	0.03	0.03	0.03	0.06	0.37	0.03 - 1.96
Trichloroethylene	0.05	0.06	0.00	0.05	0.00	0.03	0.03	0.05	0.08	0.08	0.08	0.09	0.03 - 0.09
Bromodichloromethane	0.30	20.8	1.40	10.0	2.00	1.40	2.41	17.2	36.0	43.6	45.1	47.0	0.19 - 47.2
Dibromochloromethane	0.30	8.02	0.56	3.73	0.75	0.80	0.98	6.40	14.7	16.6	17.8	18.6	0.19 - 21.2
Tetrachloroethylene	0.05	0.10	0.00	0.10	0.00	0.07	0.10	0.11	0.12	0.13	0.13	0.14	0.03 - 0.15
Bromoform	0.30	0.78	0.09	0.55	0.06	0.19	0.19	0.58	1.23	1.59	1.76	1.88	0.19 - 2.05

a/ Mid. Q.L. = Median Quantifiable Limit
b/ Arith. S.E. = Standard Error of Arithmetic Mean
c/ Geo. Mean = Geometric Mean
d/ Geo. S.E. = Standard Error of Geometric Mean

TABLE 157. MEDIANS AND THEIR RATIOS COMPARING DAYTIME PERSONAL AIR TO DAYTIME OUTDOOR AIR AND DAYTIME OUTDOOR AIR TO BREATH - CONTRA COSTA

	Medians			Ratios	
Compound	Breath	Daytime Personal Air	Daytime Outdoor Air	Personal to Outdoor	Outdoor to Breath
Chloroform	0.04	0.03	0.03	1.00	0.75
1,2-Dichloroethane	0.03	0.13	0.03	4.33	1.00
1,1,1-Trichloroethane	0.09	5.50	2.20	2.50	24.4
Benzene	1.80	6.30	1.30	4.85	0.72
Carbon Tetrachloride	0.20	0.80	0.38	2.11	1.90
Trichloroethylene	0.17	0.50	0.11	4.55	0.65
Tetrachloroethylene	2.00	2.20	0.24	9.17	0.12
Styrene	0.49	0.83	0.18	4.61	0.37
m,p-Dichlorobenzene	0.86	0.91	0.15	6.07	0.17
o-Dichlorobenzene	0.03	0.03	0.02	1.50	0.67
Ethylbenzene	0.44	2.90	0.40	7.25	0.91
o-Xylene	0.36	3.60	0.37	9.73	1.03
m,p-Xylene	1.10	10.0	1.20	8.33	1.09
n-Decane	0.69	1.00	3.40	0.29	4.93
n-Dodecane	0.17	0.95	0.12	7.92	0.71
1,4-Dioxane	0.03	0.07	0.02	3.50	0.67
n-Octane	0.50	2.30	0.22	10.4	0.44
n-Undecane	0.69	1.30	0.46	2.83	0.67
a-Pinene	0.33	0.95	0.05	19.0	0.15

Figures 67 through 70 show box plots for several compounds for breath and air. These plots demonstrate the trend of higher personal air levels. The plots also show the skewness of some of the concentration levels.

Tables 158 and 159 give a general comparison between the magnitude of the selected compound levels and the median quantifiable limits (mid QLs) by media. Benzene, tetrachloroethylene, ethylbenzene, o-xylene, and m,p-xylene appeared high for breath and air, while 1,2-dichloroethane, o-dichlorobenzene, and 1,4-dioxane appeared low. Carbon tetrachloride, 1,1,1-trichloroethane, and n-decane appeared high for air but low for breath. For water only 1,1,1-trichloroethane appeared to be low in comparison with the median quantifiable limits.

CORRELATIONS

To gain further understanding of the possible relationships between the media, Spearman correlations were calculated for all amounts and for measurable amounts only. The limited sample sizes for outdoor air make it difficult to draw any conclusions regarding this media. Generally, there seemed to be little strong correlation between the media with most correlations less than .50. The most significant correlations for all amounts (see Tables 160 and 161) appeared between overnight personal air and daytime personal air with carbon tetrachloride and m,p-dichlorobenzene showing correlations greater than .50.

Tables 162 and 163 give the Spearman correlations for measurable amounts only. If the sample size was less than five, then the correlation was not reported. As in the previous tables, there were few examples of strong correlations between the media. However, between overnight personal air and daytime personal air, thirteen of the nineteen compounds showed correlations of .40 or higher.

Figures 71 through 94 show scatter plots for breath versus daytime personal air, breath versus daytime outdoor air, and overnight personal air versus overnight outdoor air for selected compounds on the natural logarithmic scale. One was added to each value before the logarithm was taken. The lines represent the median QL values for the compounds for the two media. An "O" represents both measurable, while an "X" represents one or both not measurable. The Spearman correlations for all amounts and measurable amounts only are also shown. These plots again

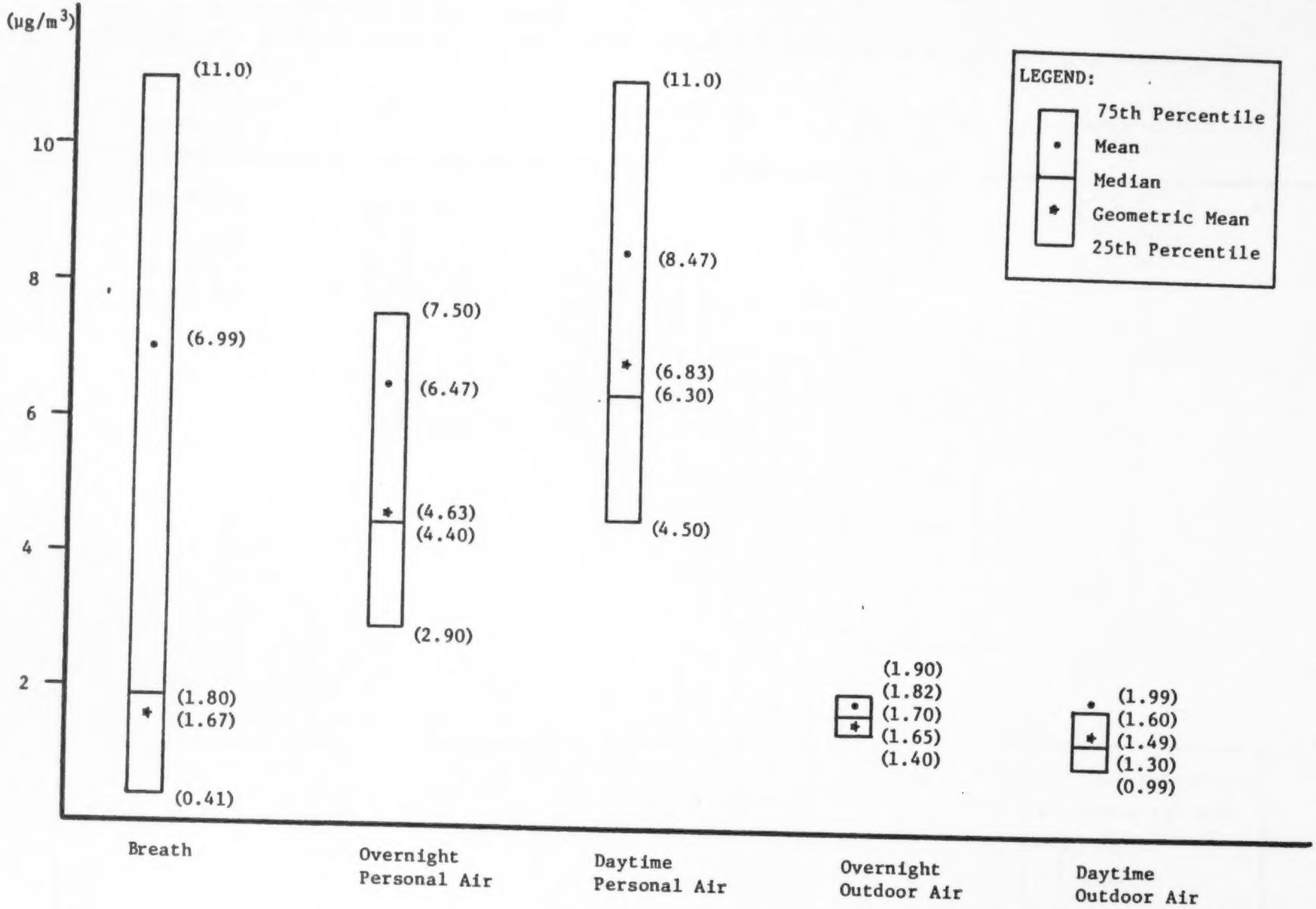


Figure 67. Box plots for weighted arithmetic means, geometric means, medians, 25th and 75th percentiles for benzene - Contra Costa

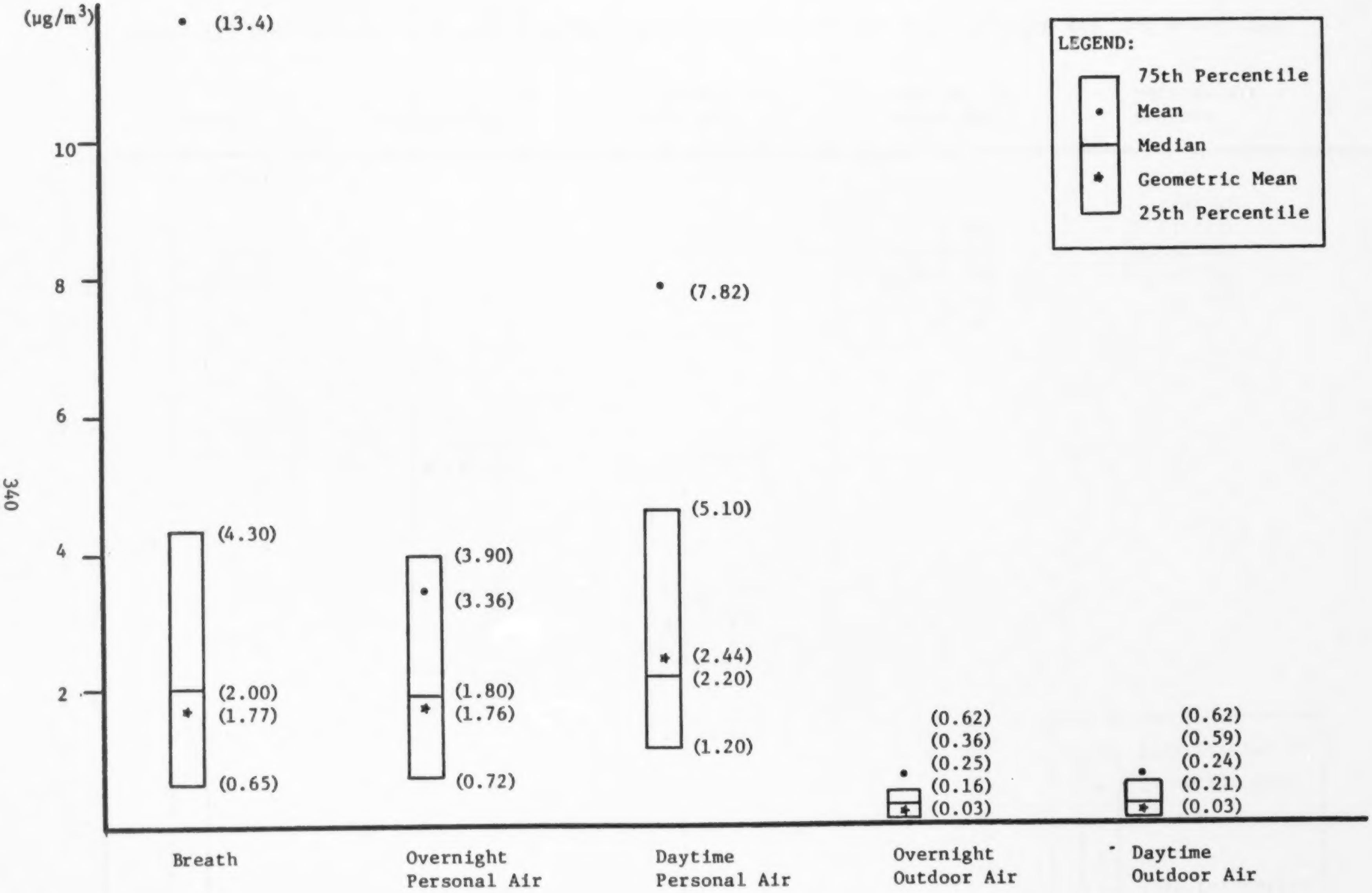


Figure 68. Box plots for weighted arithmetic means, geometric means, medians, 25th and 75th percentiles for tetrachloroethylene - Contra Costa

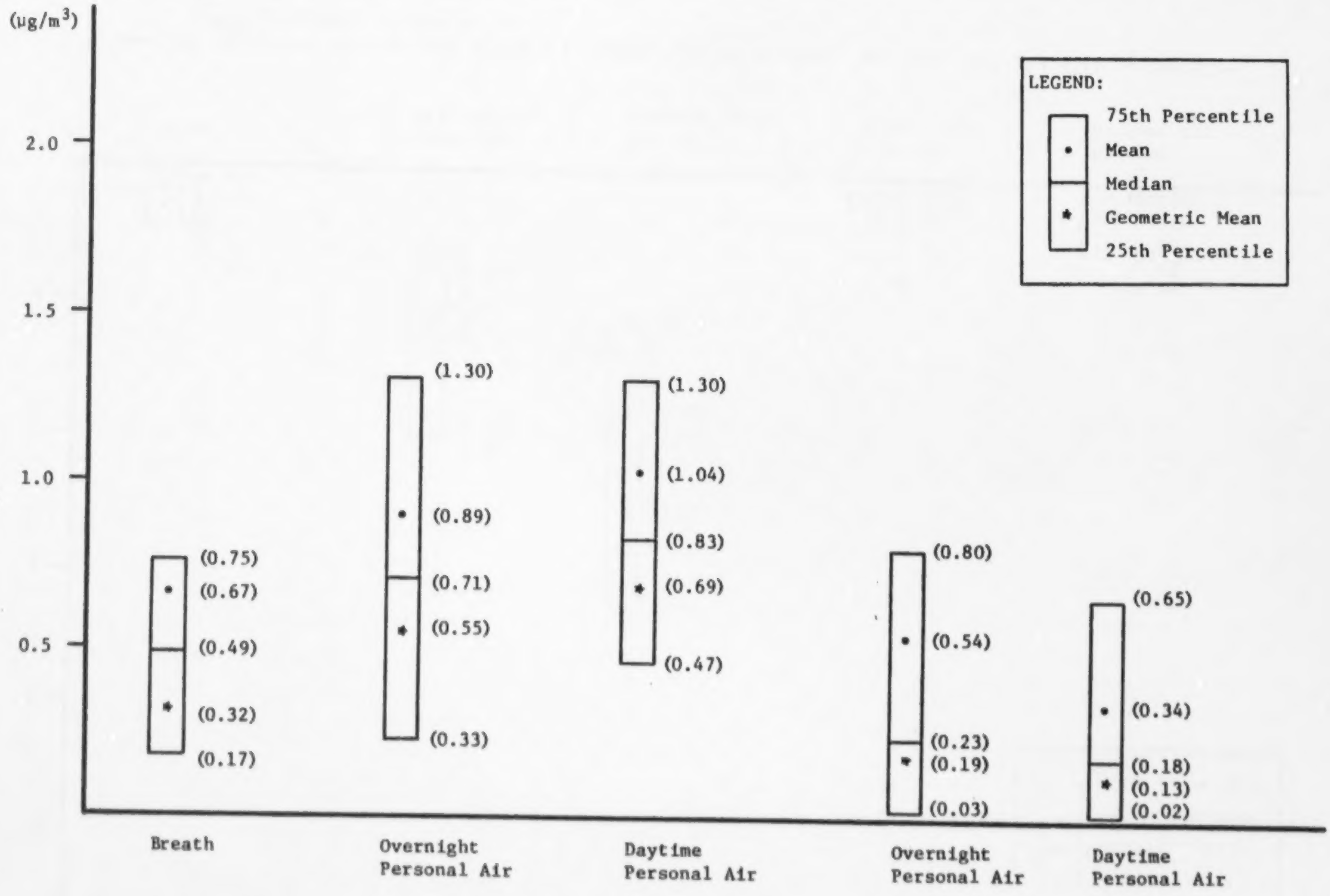


Figure 69. Box plots for weighted arithmetic means, geometric means, medians, 25th and 75th percentiles for styrene - Contra Costa

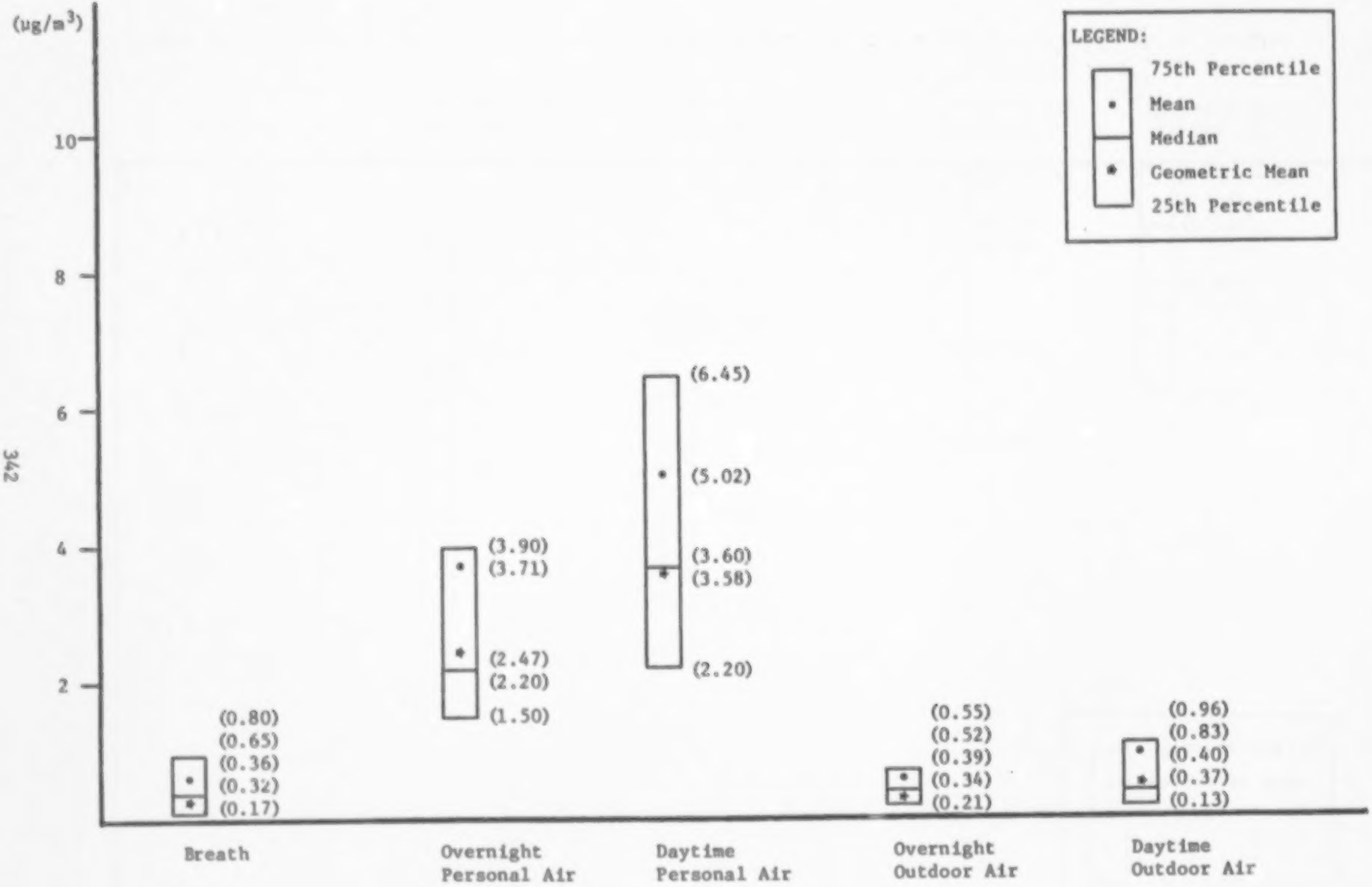


Figure 70. Box plots for weighted arithmetic means, geometric means, medians, 25th and 75th percentiles for o-xylene - Contra Costa

TABLE 158. SUMMARY OF THE MAGNITUDE OF SELECTED COMPOUND LEVELS COMPARED TO THE MEDIAN QUANTIFIABLE LIMITS FOR BREATH AND AIR SAMPLES -- CONTRA COSTA

Compound	Breath	Overnight Personal Air	Daytime Personal Air	Overnight Outdoor Air	Daytime Outdoor Air
Chloroform	low	low	low	high	low
1,2-Dichloroethane	low	low	low	low	low
1,1,1-Trichloroethane	low	high	high	high	high
Benzene	high	high	high	high	high
Carbon Tetrachloride	low	high	high	high	high
Trichloroethylene	low	high	high	high	high
Tetrachloroethylene	high	high	high	low	low
Styrene	high	high	high	high	high
m,p-Dichlorobenzene	high	high	high	high	low
o-Dichlorobenzene	low	low	low	low	low
Ethylbenzene	high	high	high	high	high
o-Xylene	high	high	high	high	high
m,p-Xylene	high	high	high	high	high
n-Decane	low	high	high	high	high
n-Dodecane	low	high	high	low	low
1,4-Dioxane	low	low	low	low	low
n-Octane	low	high	high	low	low
n-Undecane	low	high	high	low	low
a-Pinene	low	high	high	low	low

TABLE 159. SUMMARY OF THE MAGNITUDE OF SELECTED COMPOUND LEVELS COMPARED TO THE MEDIAN QUANTIFIABLE LIMITS FOR WATER -- CONTRA COSTA

Compound	Water
Chloroform	high
1,1,1-Trichloroethane	low
Trichloroethylene	high
Bromodichloromethane	high
Dibromochloromethane	high
Tetrachloroethylene	high
Bromoform	high

TABLE 160. SPEARMAN CORRELATIONS BETWEEN MEDIA FOR ALL AMOUNTS OF SELECTED COMPOUNDS — CONTRA COSTA

	Breath and Overnight Personal Air		Breath and Daytime Personal Air		Breath and Overnight Outdoor Air		Breath and Daytime Outdoor Air		Overnight Personal Air and Daytime Personal Air	
Compound	Spearman Correlation	Sample Size	Spearman Correlation	Sample Size	Spearman Correlation	Sample Size	Spearman Correlation	Sample Size	Spearman Correlation	Sample Size
Chloroform	-.23	67	.19	64	.37	9	-.06	9	.15	65
1,2-Dichloroethane	.16	65	.05	63	-.35	9	.14	9	.14	64
1,1,1-Trichloroethane	.38*	68	.25*	66	.30	9	-.27	9	.40*	67
Benzene	.40*	67	.07	65	.43	9	-.59	9	.42*	67
Carbon Tetrachloride	.41*	67	.32*	65	-.10	9	-.21	9	.53*	67
Trichloroethylene	.25*	65	.38*	64	.23	9	-.42	9	.42*	65
Tetrachloroethylene	.41*	67	.46*	65	.43	9	-.15	9	.44*	67
Styrene	.19	67	-.00	64	-.19	9	-.27	9	.28*	66
m,p-Dichlorobenzene	.49*	67	.49*	65	.49	9	-.29	9	.73*	67
o-Dichlorobenzene	-.15	63	.10	62	.00	9	.00	9	.16	63
Ethylbenzene	.22	66	.06	64	.21	9	-.35	9	.38*	67
o-Xylene	.29*	65	.17	63	-.20	9	-.39	9	.46*	67
m,p-Xylene	.27*	67	.25*	65	-.14	9	-.45	9	.44*	67
n-Decane	-.05	66	.27*	64	.61	9	-.22	9	.32*	67
n-Dodecane	-.03	64	-.07	63	.49	9	-.63	9	.43*	66
1,4-Dioxane	.13	66	.10	62	.07	9	-.55	9	.26*	65
n-Octane	-.13	65	-.09	63	-.08	9	.07	9	.48*	67
n-Undecane	.01	65	.13	64	.40	9	-.12	9	.44*	66
α-Pinene	.24	65	.24	63	.29	9	-.41	9	.38*	66

continued

TABLE 160. continued

Compound	Overnight Personal Air and Overnight Outdoor Air		Overnight Personal Air and Daytime Outdoor Air		Daytime Personal Air and Overnight Outdoor Air		Daytime Personal Air and Daytime Outdoor Air		Overnight Outdoor Air and Daytime Outdoor Air	
	Spearman Corre-lation	Sample Size	Spearman Corre-lation	Sample Size	Spearman Corre-lation	Sample Size	Spearman Corre-lation	Sample Size	Spearman Corre-lation	Sample Size
Chloroform	-.24	10	.08	9	-.57	10	.57	9	-.34	9
1,2-Dichloroethane	.25	10	-.69*	9	-.38	10	-.45	9	-.36	9
1,1,1-Trichloroethane	.07	10	-.13	10	.04	10	-.32	10	.06	10
Benzene	.15	10	-.46	10	-.34	10	-.06	10	.17	10
Carbon Tetrachloride	-.12	10	-.24	10	-.40	10	-.20	10	.60	10
Trichloroethylene	.11	10	.17	9	-.18	10	-.27	9	.21	9
Tetrachloroethylene	.66*	10	.18	10	.12	10	-.15	10	.55	10
Styrene	-.36	10	-.54	10	-.33	10	-.01	10	.82*	10
m,p-Dichlorobenzene	-.20	10	-.06	9	.00	10	.16	9	-.43	9
o-Dichlorobenzene	-.31	10	-.03	9	-.69*	10	.76*	9	-.44	9
Ethylbenzene	.15	10	-.18	10	-.28	10	-.21	10	.54	10
o-Xylene	-.37	10	-.21	10	-.32	10	-.30	10	.66*	10
m,p-Xylene	-.27	10	-.22	10	-.26	10	-.34	10	.53	10
n-Decane	.15	10	.70*	9	.32	10	.40	9	.39	9
n-Dodecane	-.21	10	.54	9	-.19	10	.08	9	-.39	9
1,4-Dioxane	-.35	10	-.09	10	-.78*	10	-.02	10	-.02	10
n-Octane	-.25	10	.03	9	-.36	10	-.17	9	-.09	9
n-Undecane	.10	10	-.14	9	.10	10	.25	9	.13	9
a-Pinene	.02	10	.54	9	-.16	10	.00	9	-.01	9

* Significantly different from zero at .05 level.

TABLE 161. SPEARMAN CORRELATIONS BETWEEN WATER AND THE OTHER MEDIA FOR ALL AMOUNTS OF SELECTED COMPOUNDS -- CONTRA COSTA

Compound	Breath		Overnight Personal Air		Daytime Personal Air		Overnight Outdoor Air		Daytime Outdoor Air	
	Spearman Corre-lation	Sample Size	Spearman Corre-lation	Sample Size	Spearman Corre-lation	Sample Size	Spearman Corre-lation	Sample Size	Spearman Corre-lation	Sample Size
Chloroform	.13	68	-.02	70	-.02	66	.32	10	-.52	9
1,1,1-Trichloroethane	.06	69	-.07	70	-.09	68	-.11	10	-.20	10
Trichloroethylene	-.23	67	.11	69	.08	67	-.03	10	.73*	9
Bromodichloromethane	.21	66								
Dibromochloromethane	.25*	66								
Tetrachloroethylene	-.07	68	.03	70	.06	68	.48	10	.68*	10
Bromoform	.34*	67								

* Significantly different from zero at .05 level.

TABLE 162. SPEARMAN CORRELATIONS BETWEEN MEDIA FOR MEASURABLE AMOUNTS ONLY OF SELECTED COMPOUNDS -- CONTRA COSTA

Compound	Breath and Overnight Personal Air		Breath and Daytime Personal Air		Breath and Overnight Outdoor Air		Breath and Daytime Outdoor Air		Overnight Personal Air and Daytime Personal Air	
	Spearman Correlation	Sample Size	Spearman Correlation	Sample Size	Spearman Correlation	Sample Size	Spearman Correlation	Sample Size	Spearman Correlation	Sample Size
Chloroform		2		0		0		0	.15	15
1,2-Dichloroethane		0		0		0		0	.76*	9
1,1,1-Trichloroethane	.20	34	.11	34		3		3	.40*	67
Benzene	.32*	52	.07	52	.10	5	-.90*	5	.46*	66
Carbon Tetrachloride	.03	10	.05	10		2		2	.57*	60
Trichloroethylene	-.21	12	.72*	14		0		0	.19	37
Tetrachloroethylene	.29*	58	.44*	58	.41	6		4	.47*	65
Styrene	.04	41	.06	37		3		3	.41*	54
m,p-Dichlorobenzene	.40*	38	.46*	35		3		0	.56*	45
o-Dichlorobenzene		0		0		0		0		4
Ethylbenzene	.24	45	.13	45		4		2	.38*	67
o-Xylene	.10	42	.03	42		4		3	.46*	67
m,p-Xylene	.14	58	.16	56	-.47	7	-.29	7	.43*	66
n-Decane	.14	23	.01	28		4		3	.48*	47
n-Dodecane		1		2		0		0	.42*	36
1,4-Dioxane		3		2		0		0	.20	5
n-Octane	.35	14	.25	13		0		1	.50*	61
n-Undecane	.09	23	.09	23		0		0	.58*	54
a-Pinene	.38*	28	.10	25		0		0	.28	42

continued

TABLE 162. continued

	Overnight Personal Air and Overnight Outdoor Air		Overnight Personal Air and Daytime Outdoor Air		Daytime Personal Air and Overnight Outdoor Air		Daytime Personal Air and Daytime Outdoor Air		Overnight Outdoor Air and Daytime Outdoor Air	
Compound	Spearman Corre-lation	Sample Size	Spearman Corre-lation	Sample Size	Spearman Corre-lation	Sample Size	Spearman Corre-lation	Sample Size	Spearman Corre-lation	Sample Size
Chloroform	-.62	5		1		4		2		2
1,2-Dichloroethane		0		0		0		0		0
1,1,1-Trichloroethane	.07	10	-.23	9	.04	10	-.32	9	.28	9
Benzene	.15	10	-.46	10	-.34	10	-.06	10	.17	10
Carbon Tetrachloride	.00	8	-.05	8	-.17	9	.08	9	.31	8
Trichloroethylene		1		1		1		1		1
Tetrachloroethylene	.47	7	.14	6	-.12	7	-.23	6	.36	5
Styrene	.00	5	-.60	5	-.12	6	.03	6	.60	6
m,p-Dichlorobenzene		4		0		4		0		0
o-Dichlorobenzene		0		0		0		0		0
Ethylbenzene	.17	8	.13	7	-.36	8	.18	7	.70	6
o-Xylene	-.13	9	.31	8	-.07	9	.17	8	.36	8
m,p-Xylene	-.27	10	-.22	10	-.26	10	-.34	10	.53	10
n-Decane	.41	8	.54	7	.19	9	-.25	7	.64	8
n-Dodecane		0		0		0		0		0
1,4-Dioxane		0		0		0		0		1
n-Octane		3		3		3		3		1
n-Undecane		1		1		1		1		0
a-Pinene		1		0		0		0		0

* Significantly different from zero at .05 level.

TABLE 163. SPEARMAN CORRELATIONS BETWEEN WATER AND THE OTHER MEDIA FOR MEASURABLE AMOUNTS ONLY OF SELECTED COMPOUNDS -- CONTRA COSTA

Compound	Breath		Overnight Personal Air		Daytime Personal Air		Overnight Outdoor Air		Daytime Outdoor Air	
	Spearman Correlation	Sample Size	Spearman Correlation	Sample Size	Spearman Correlation	Sample Size	Spearman Correlation	Sample Size	Spearman Correlation	Sample Size
Chloroform	-.09	6	-.08	32	-.13	22	.34	7		2
1,1,1-Trichloroethane		4	.07	7	.32	7		2		2
Trichloroethylene	-.86*	11	-.22	32	-.29	33		1		1
Bromodichloromethane		3								
Dibromochloromethane		0								
Tetrachloroethylene	.05	57	.09	63	.05	63	.11	7	.26	6
Bromoform		4								

* Significantly different from zero at .05 level.

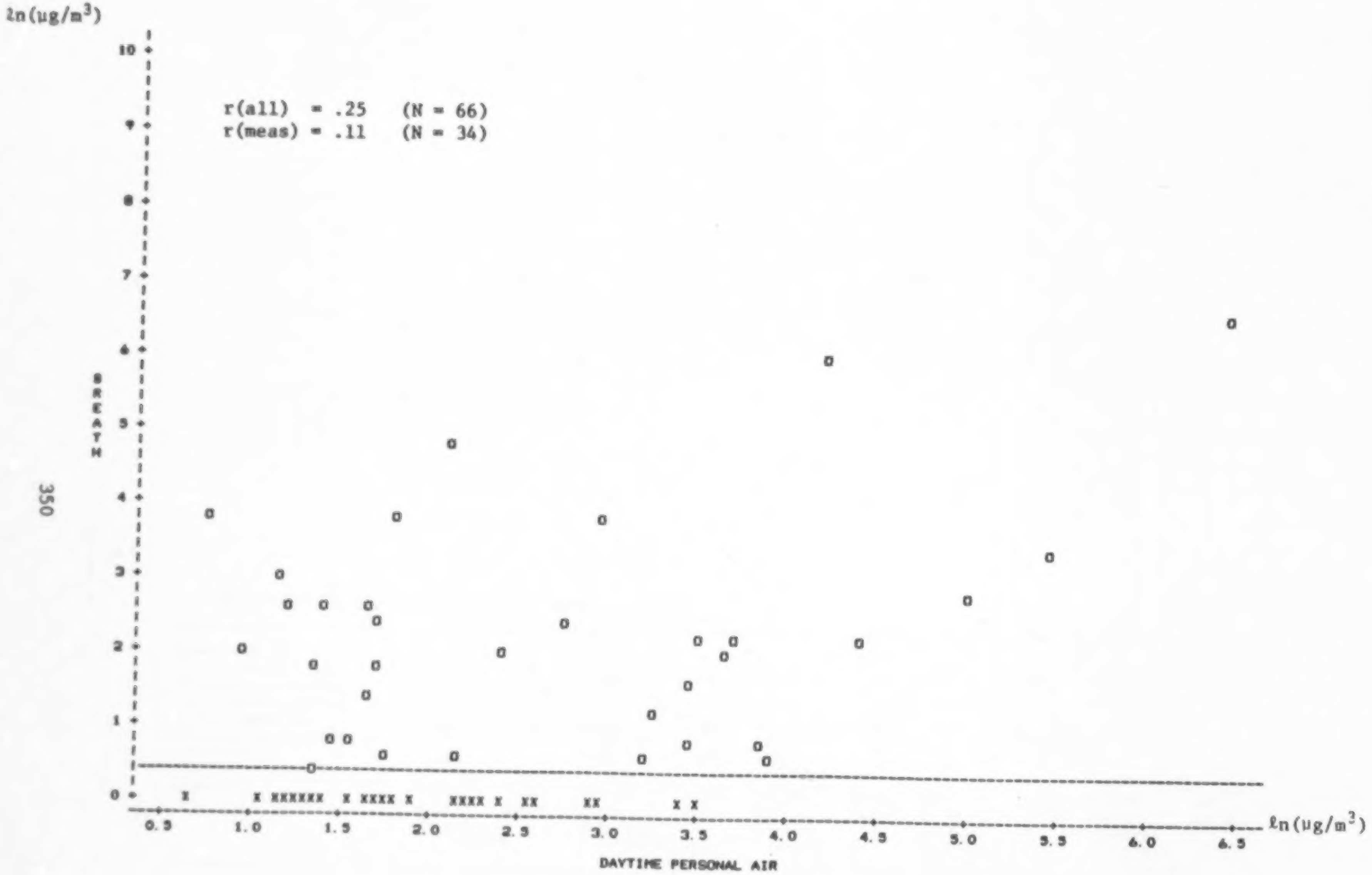


Figure 71. 1,1,1-Trichloroethane - Contra Costa

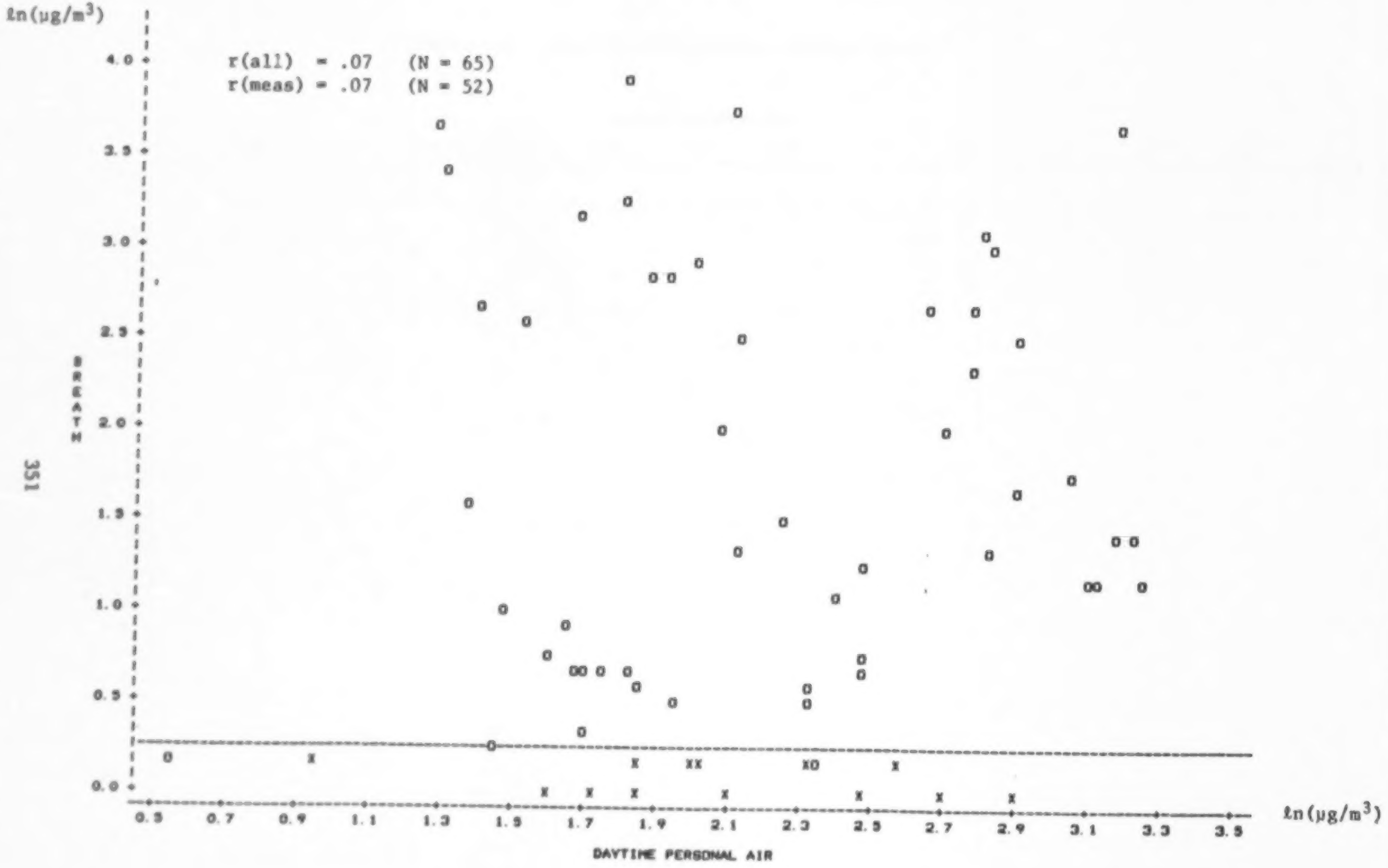


Figure 72. Benzene - Contra Costa.

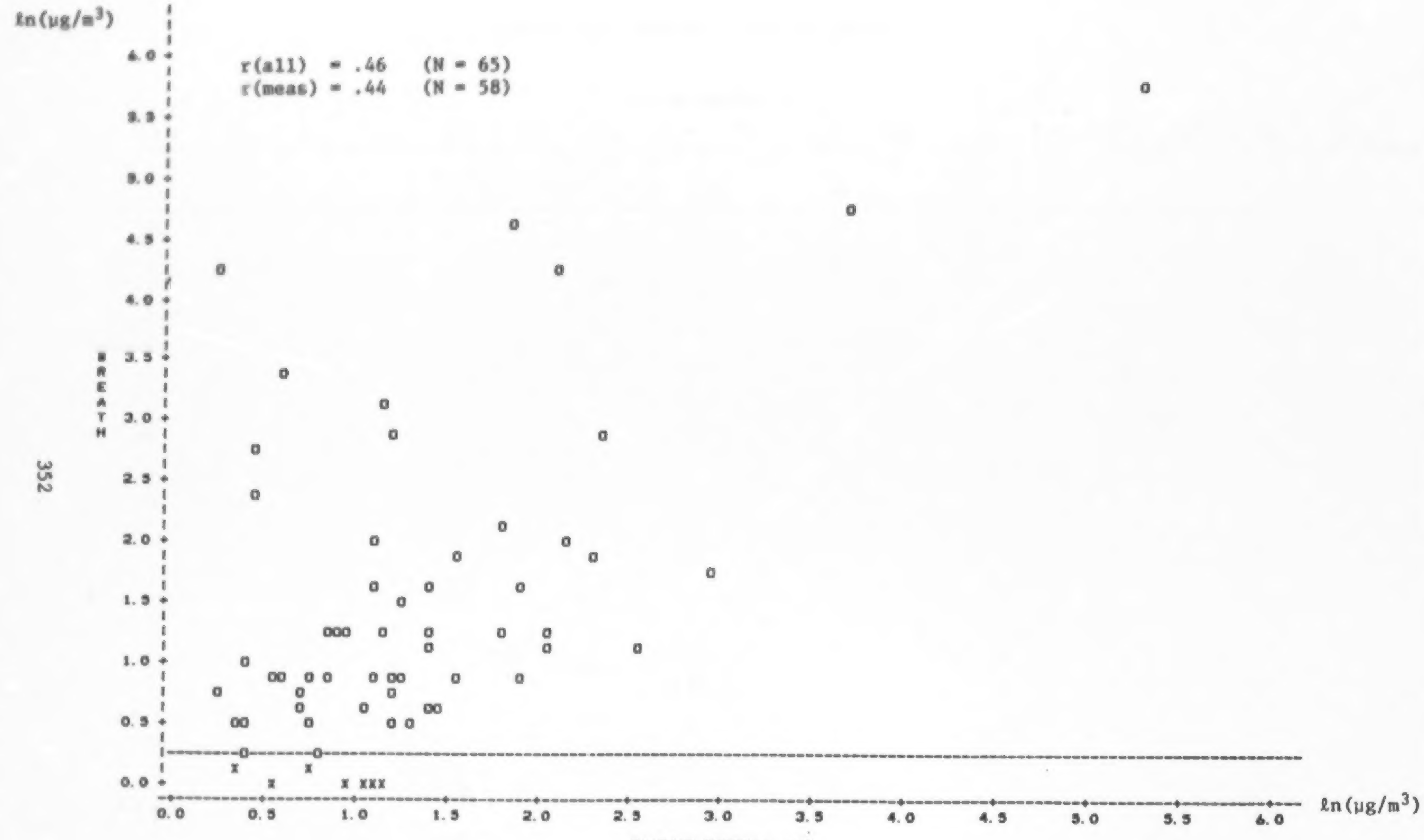


Figure 73. Tetrachloroethylene - Contra Costa.

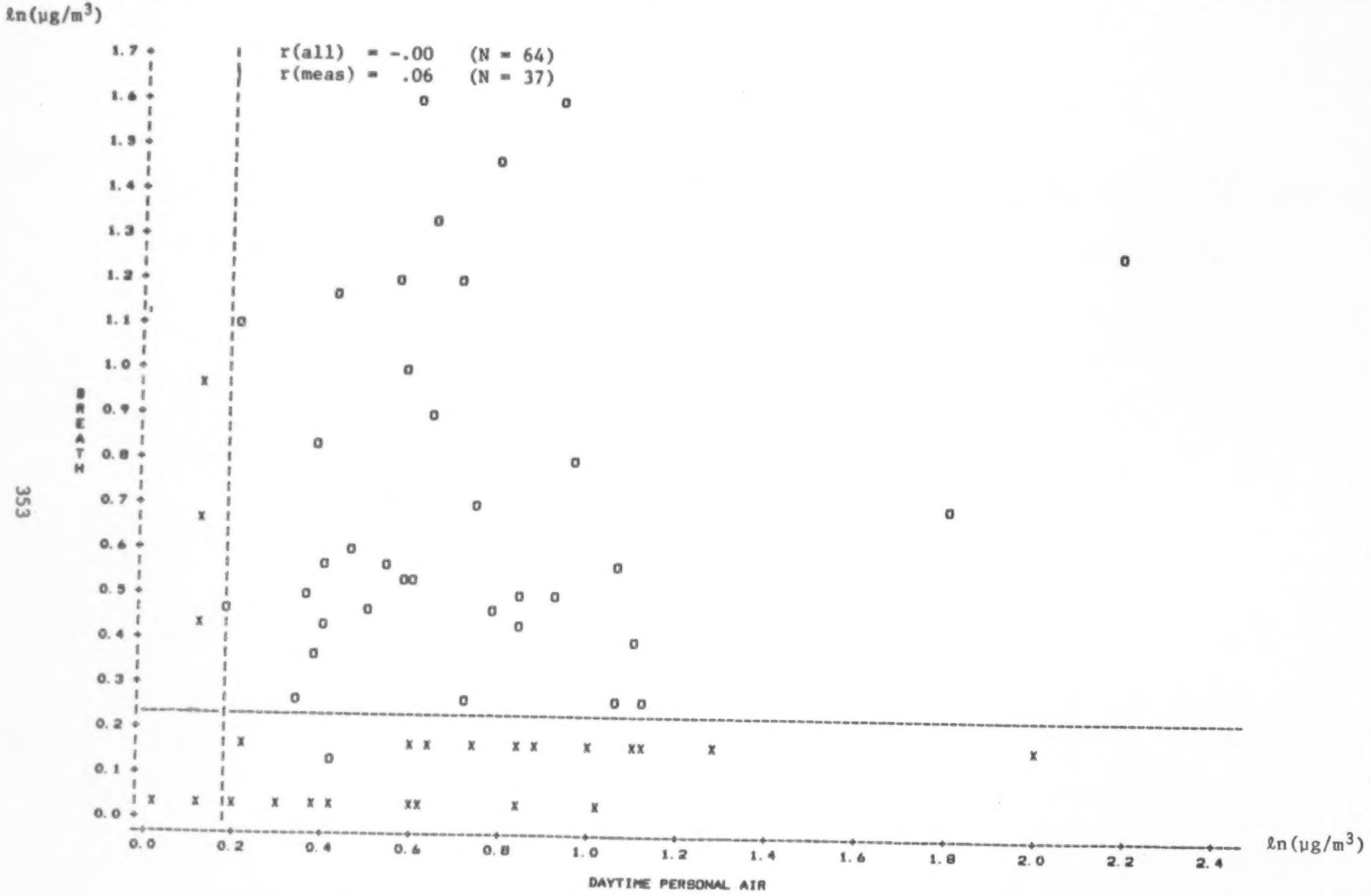


Figure 74. Styrene - Contra Costa.

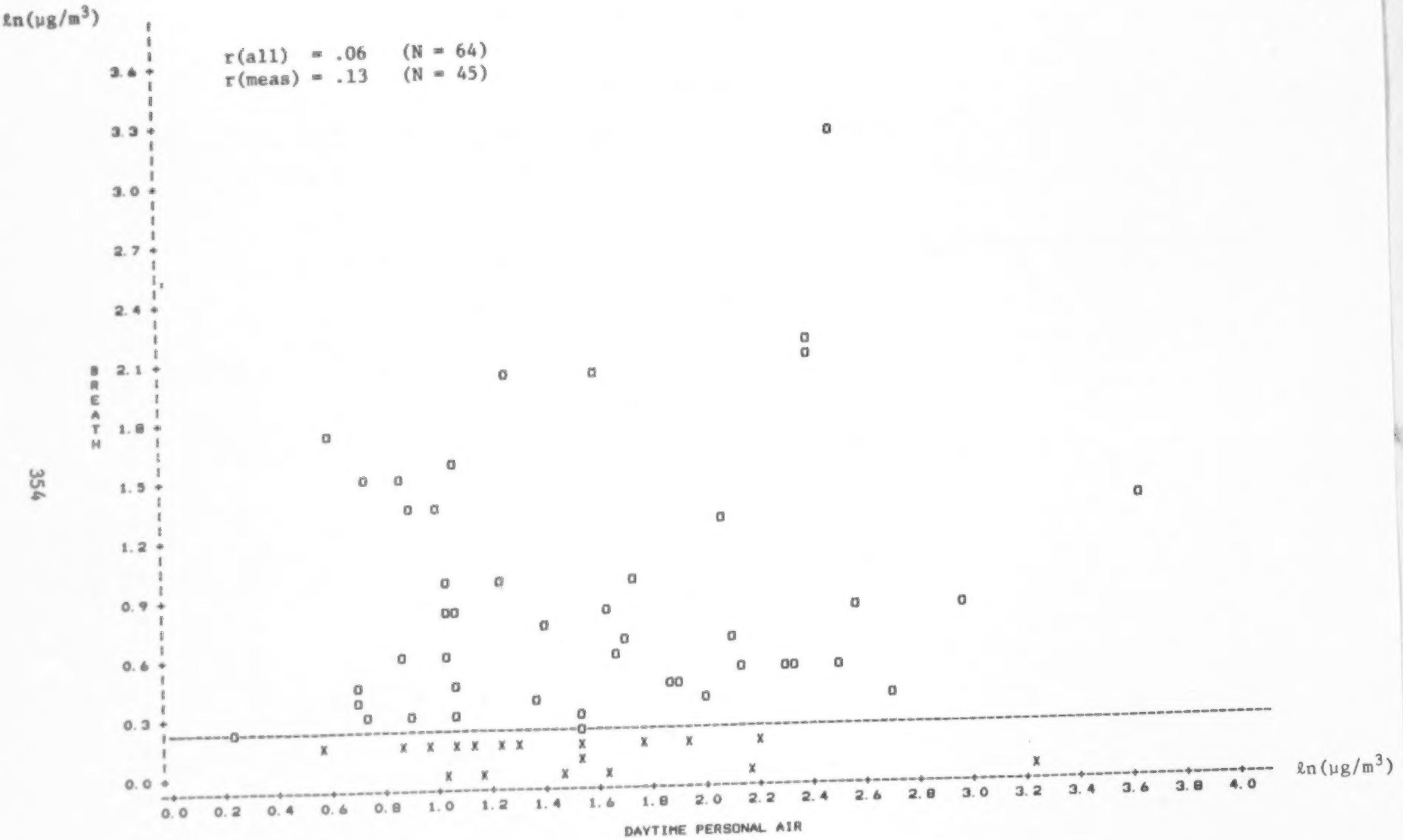


Figure 75. Ethylbenzene - Contra Costa.

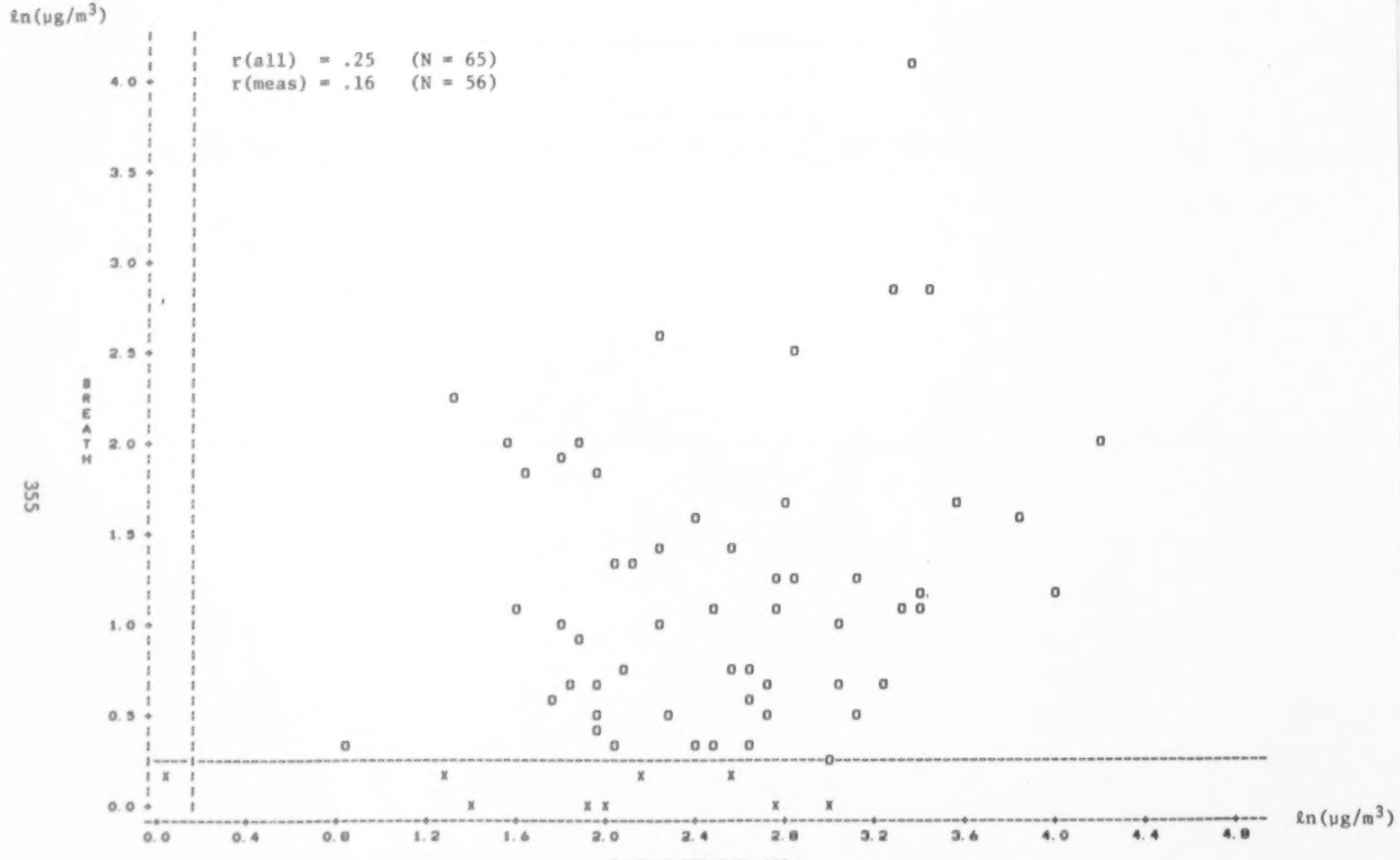


Figure 76. m,p-Xylene - Contra Costa.

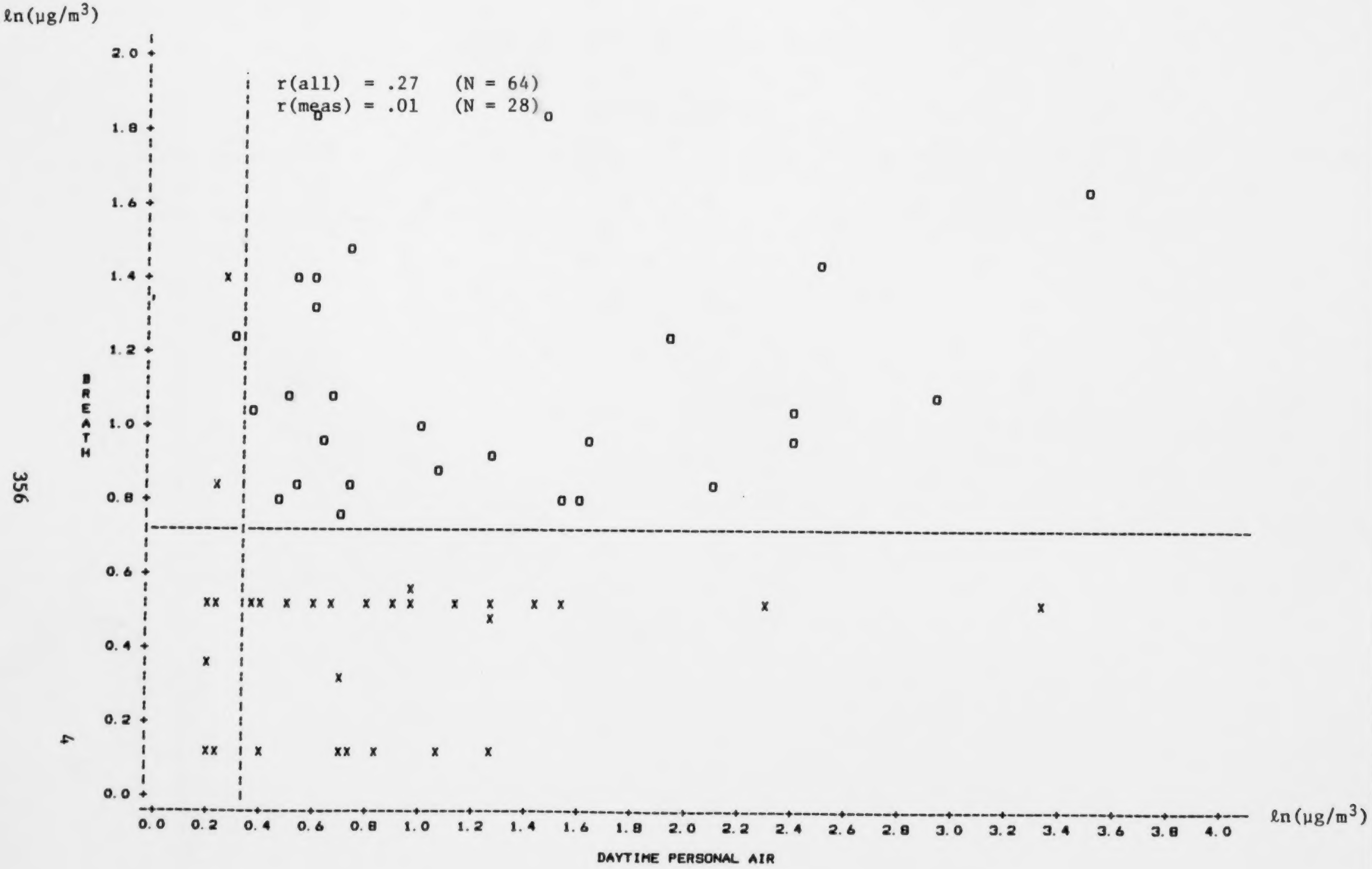


Figure 77. n-Decane - Contra Costa.

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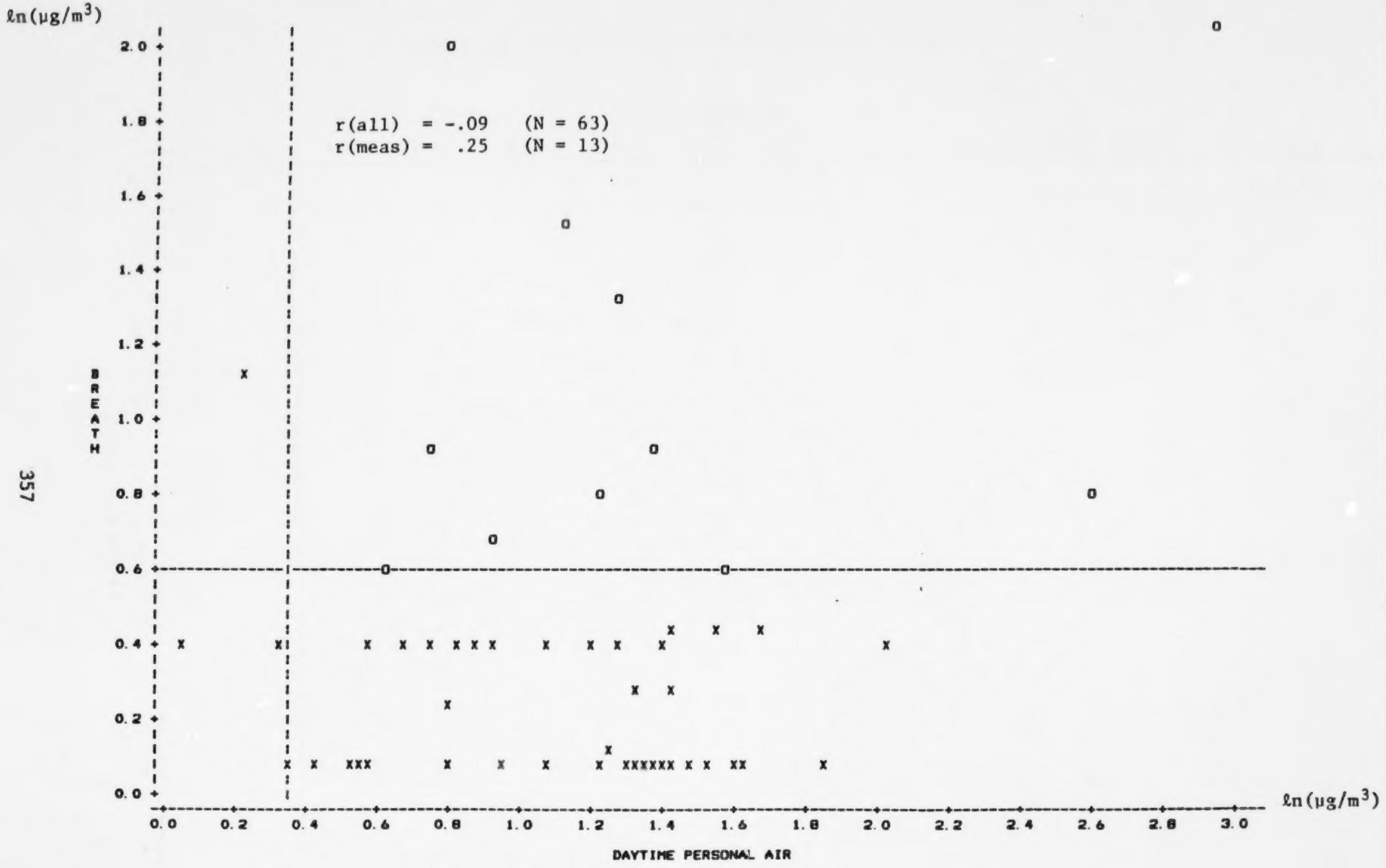

Figure 78. n-Octane - Contra Costa.

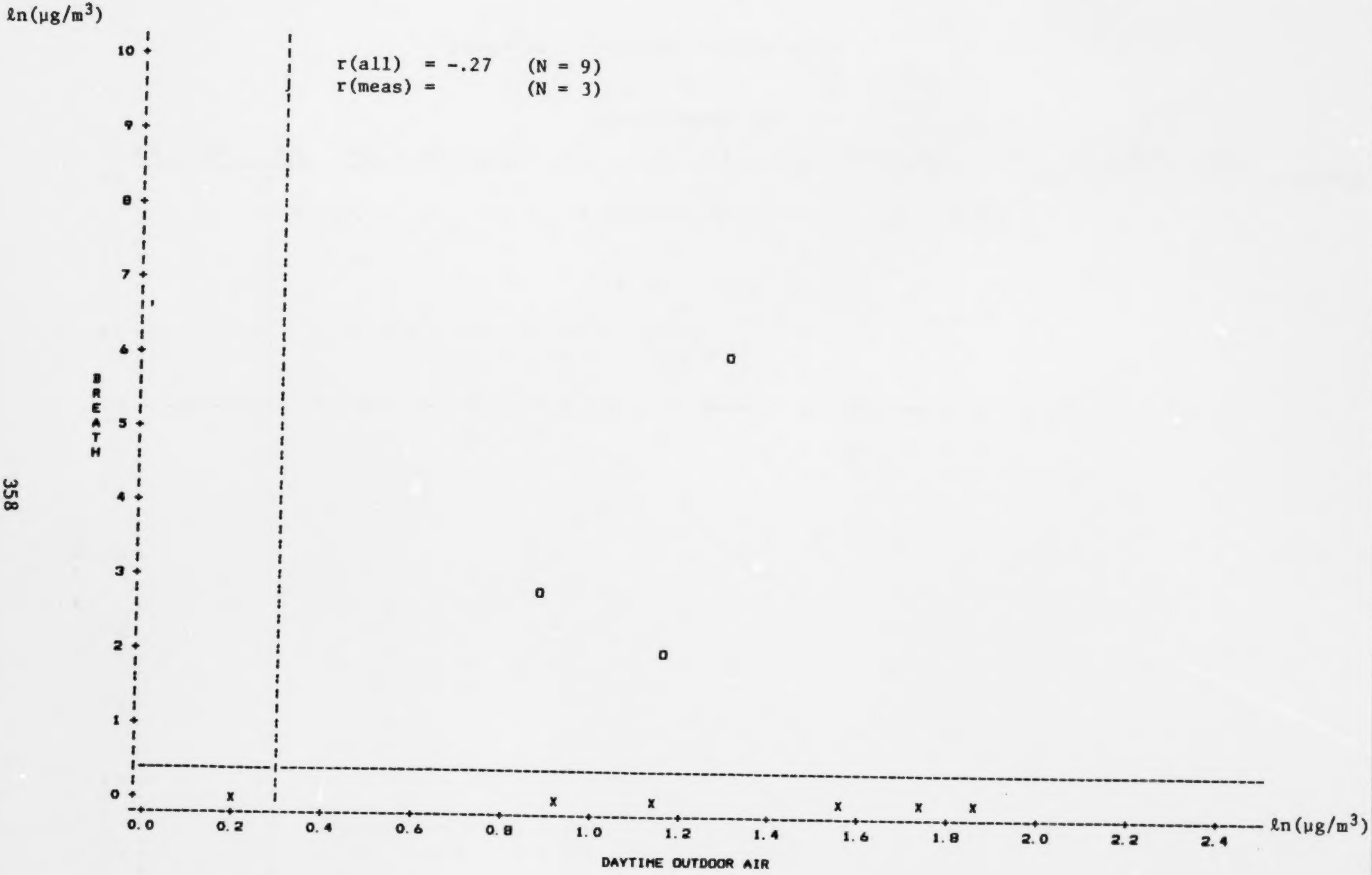

Figure 79. 1,1,1-Trichloroethane - Contra Costa.

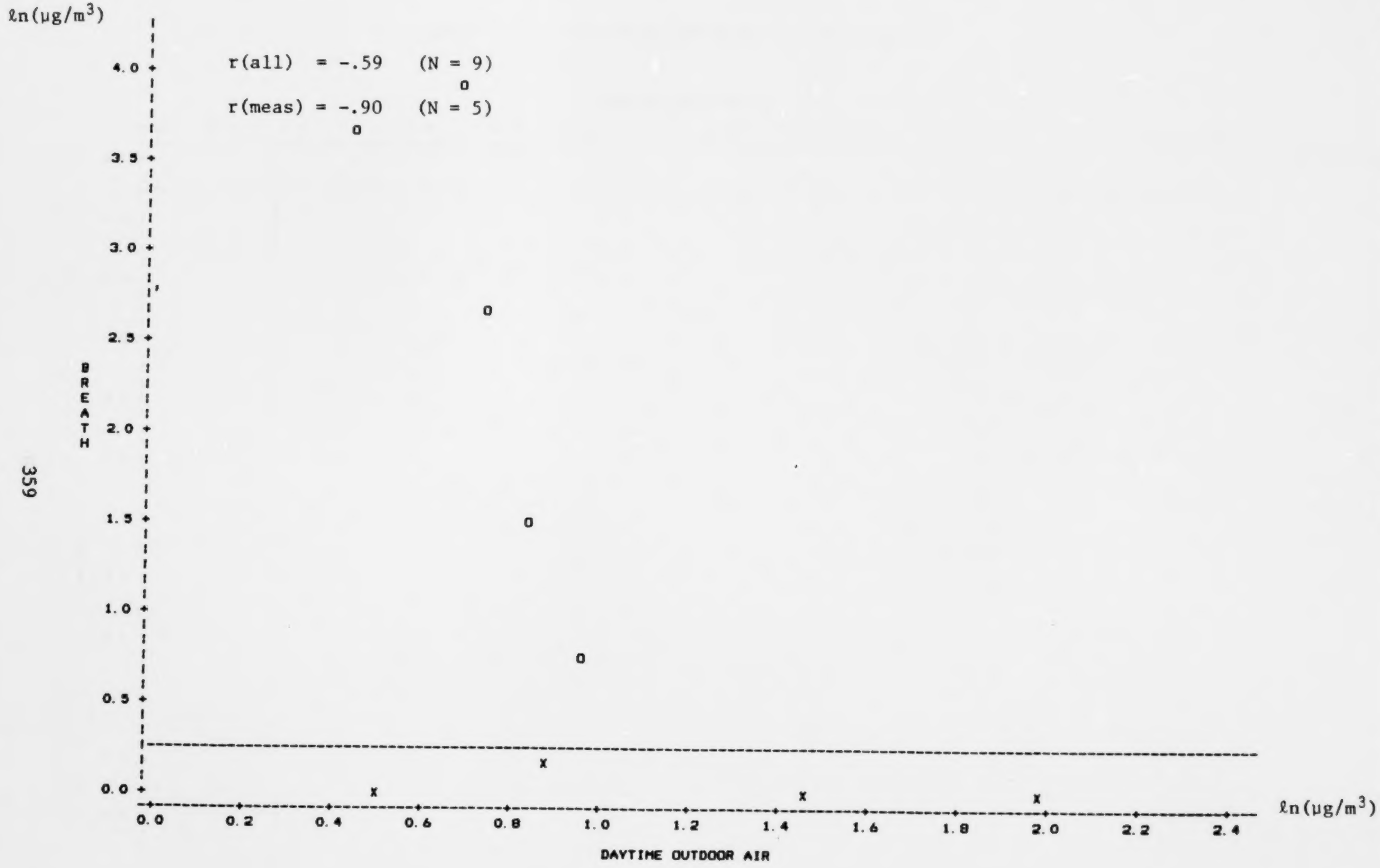

Figure 80. Benzene - Contra Costa.

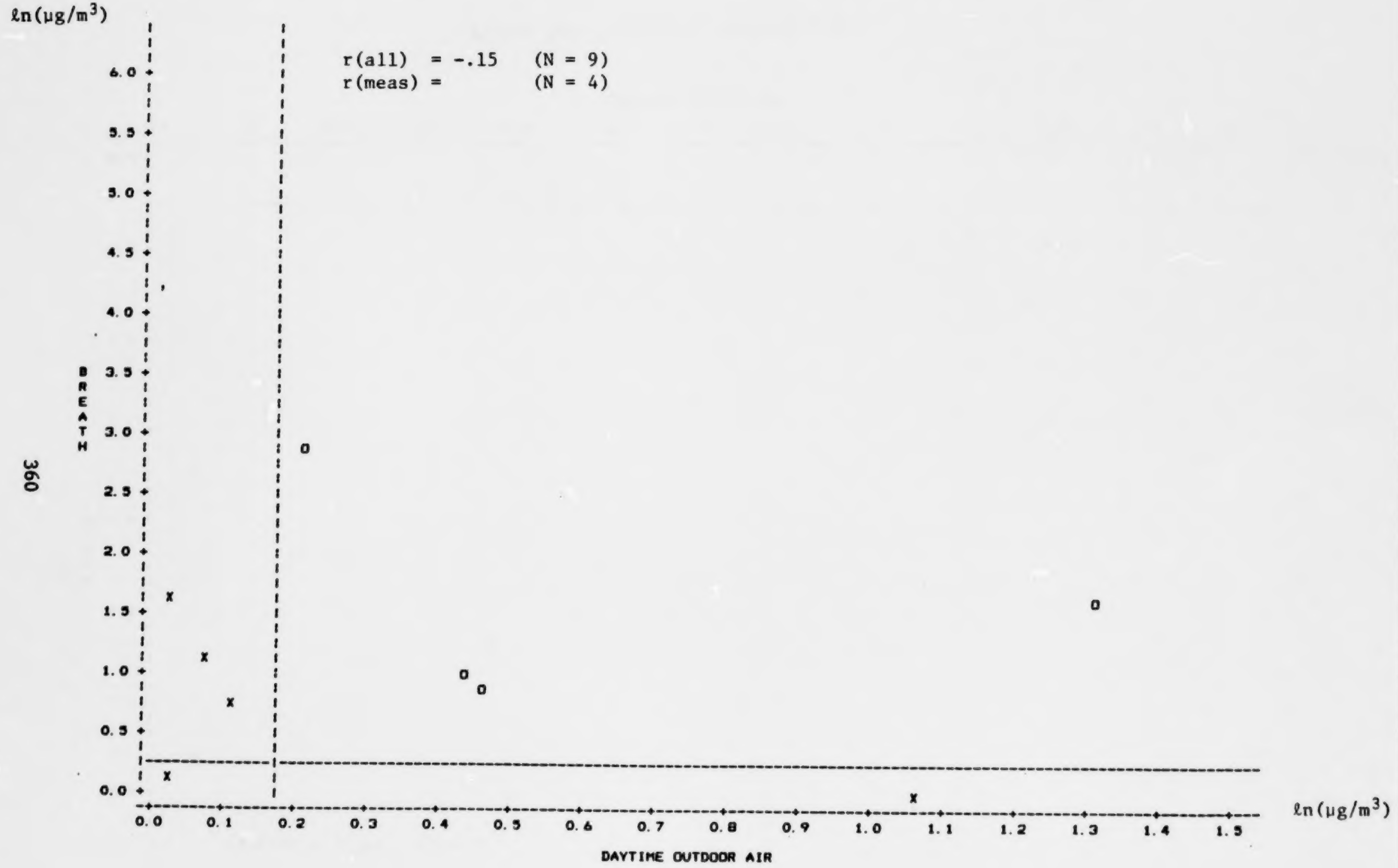

Figure 81. Tetrachloroethylene - Contra Costa.

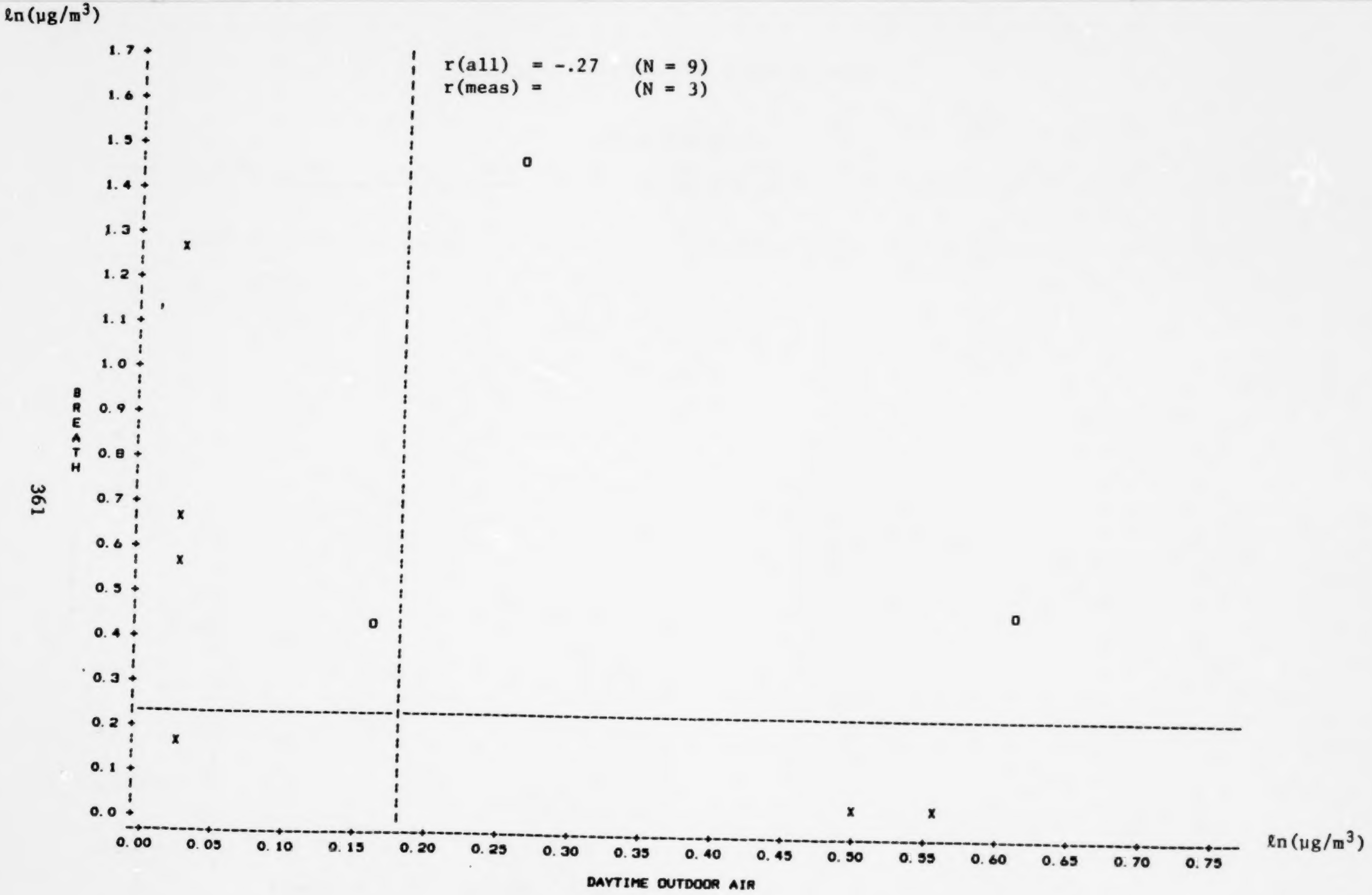

Figure 82. Styrene - Contra Costa.

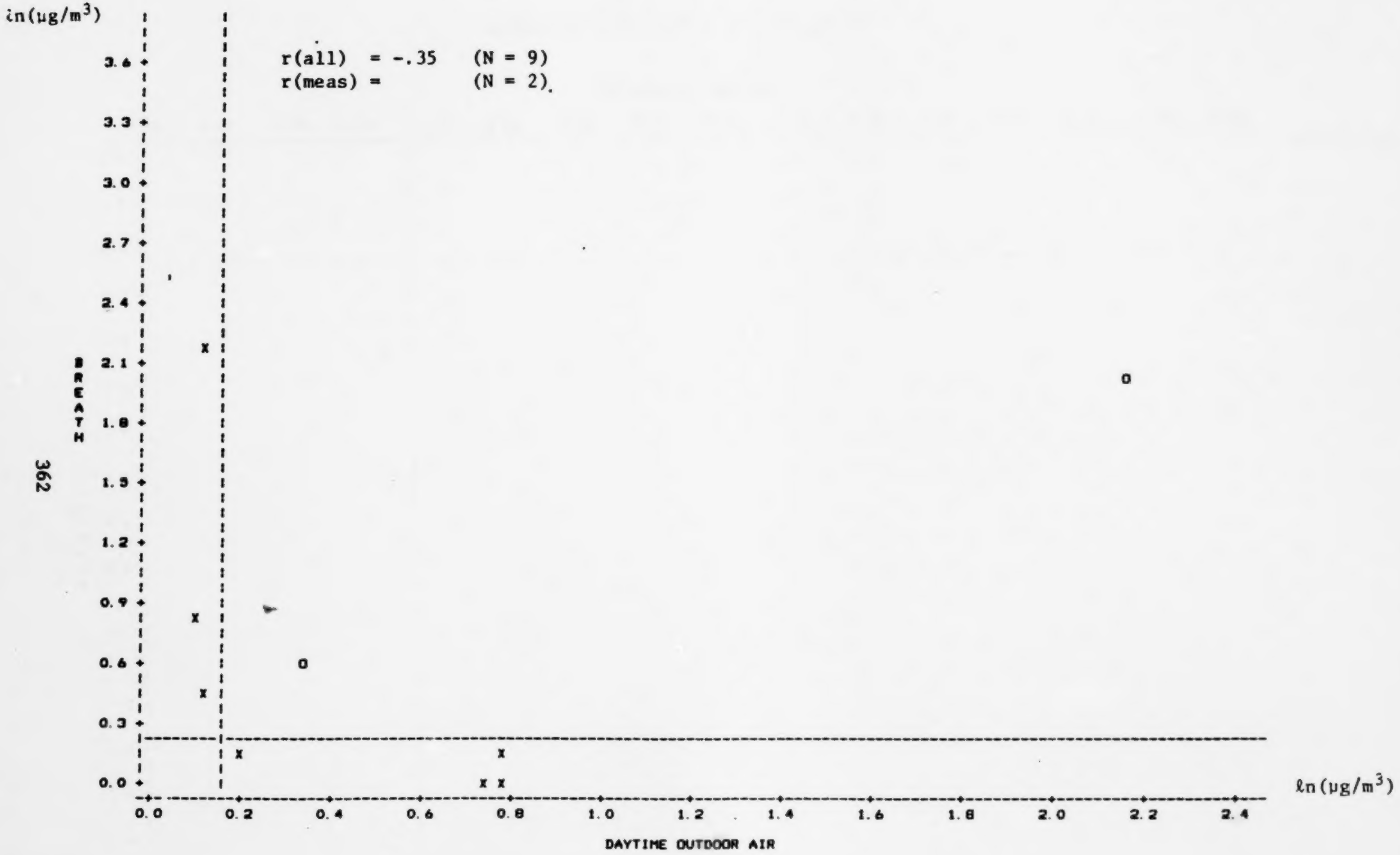

Figure 83. Ethylbenzene - Contra Costa.

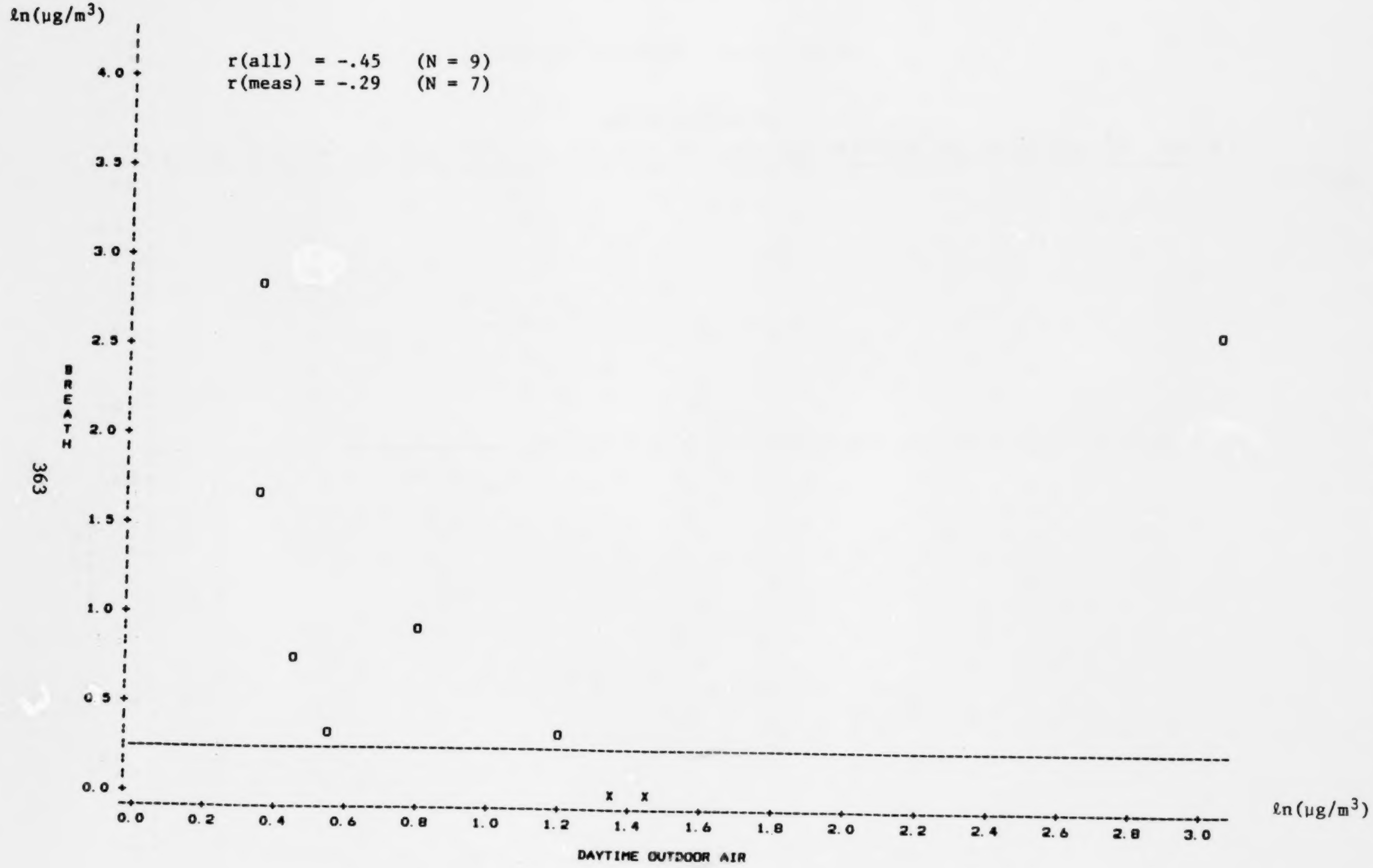

Figure 84. m,p-Xylene - Contra Costa.

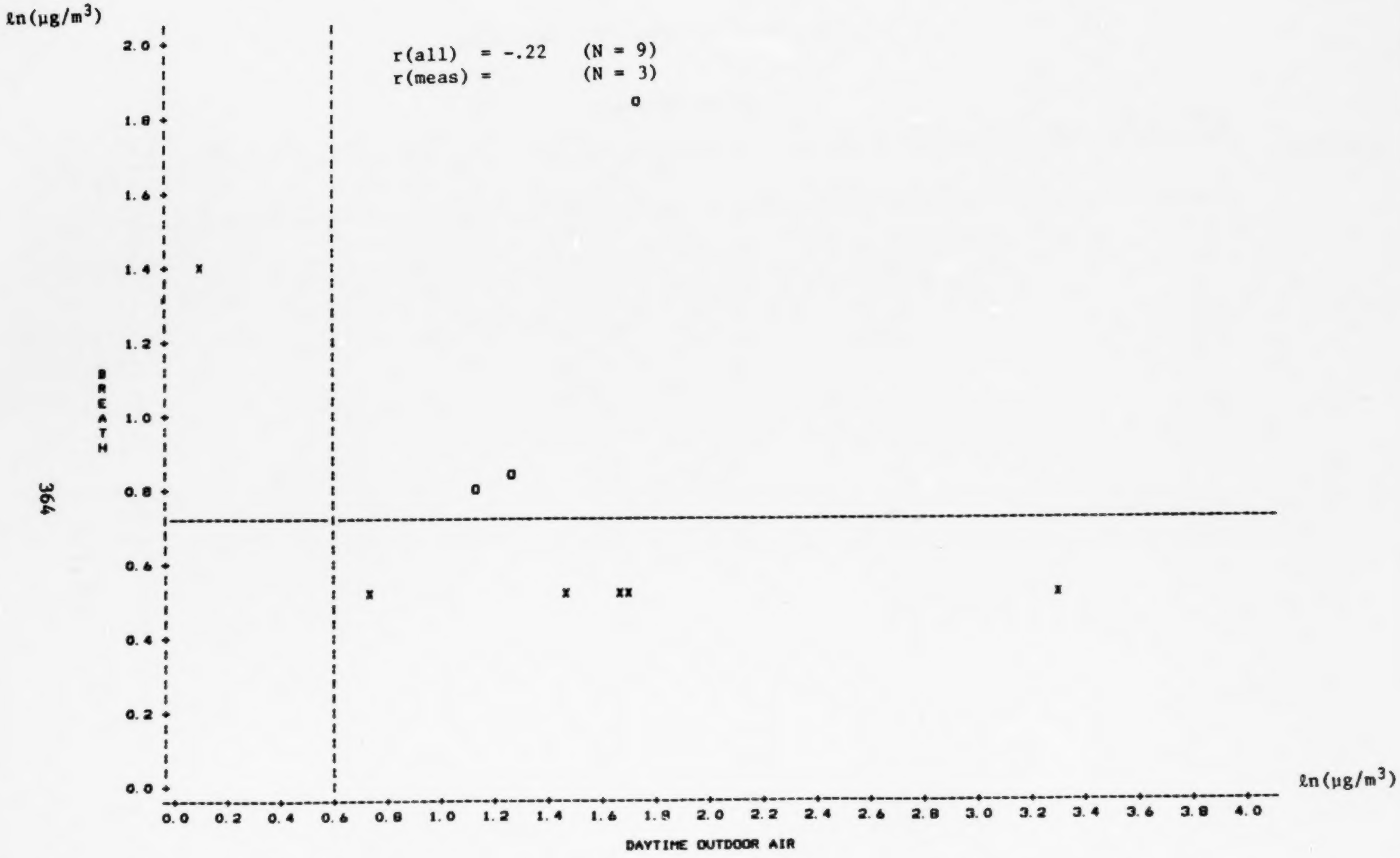

Figure 85. n-Decane - Contra Costa.

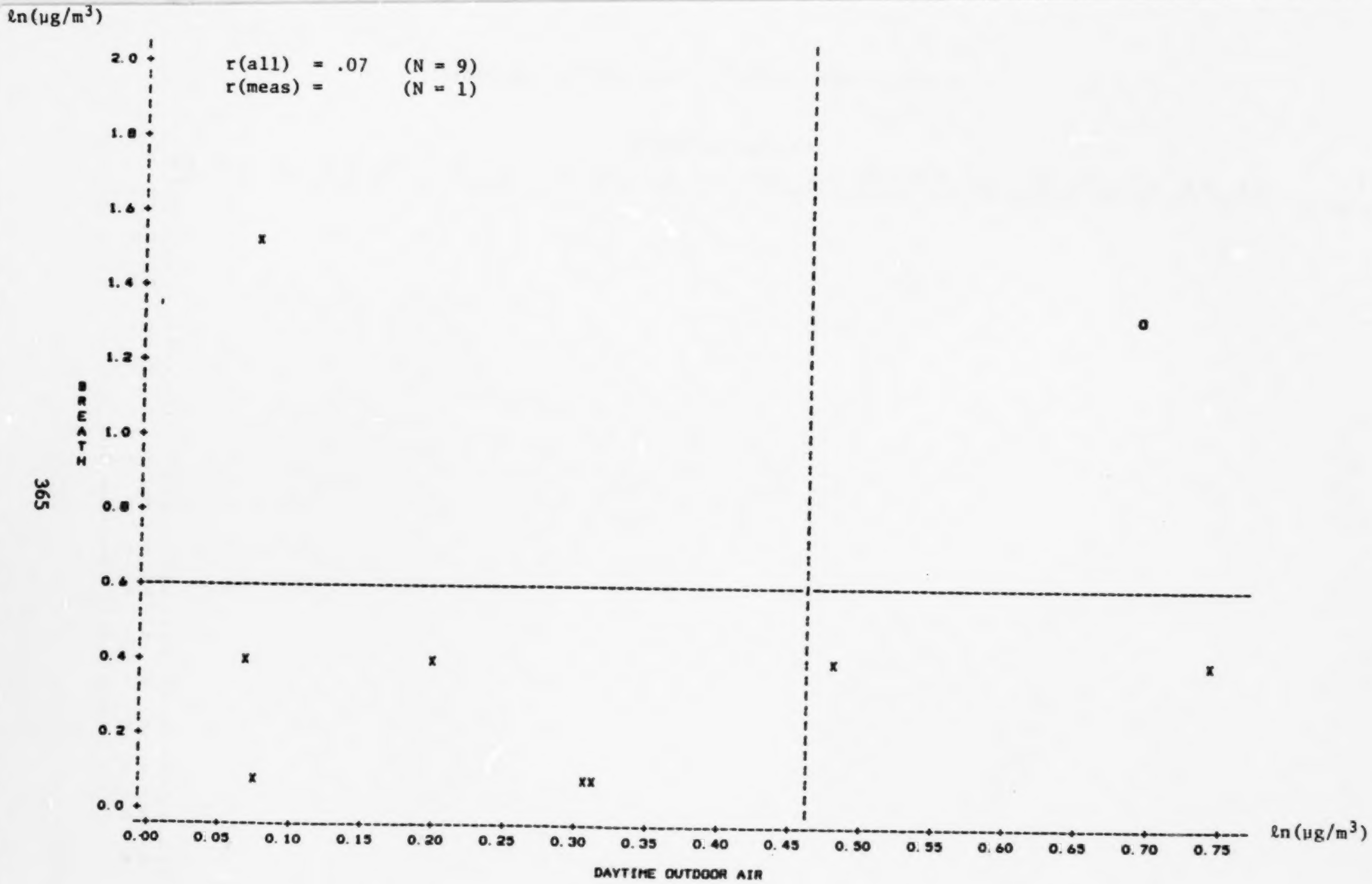

Figure 86. n-Octane - Contra Costa.

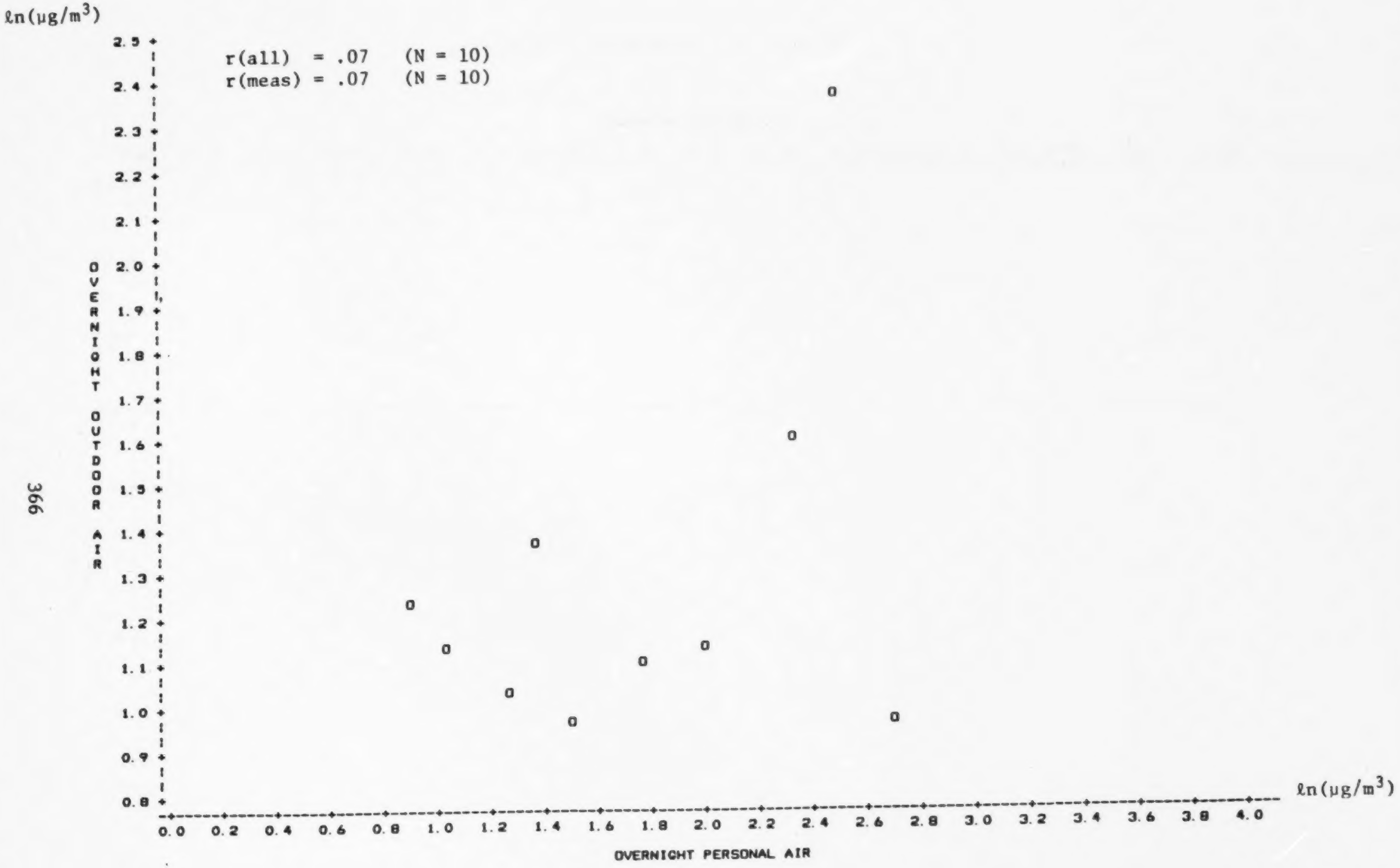

Figure 87. 1,1,1-Trichloroethane - Contra Costa.

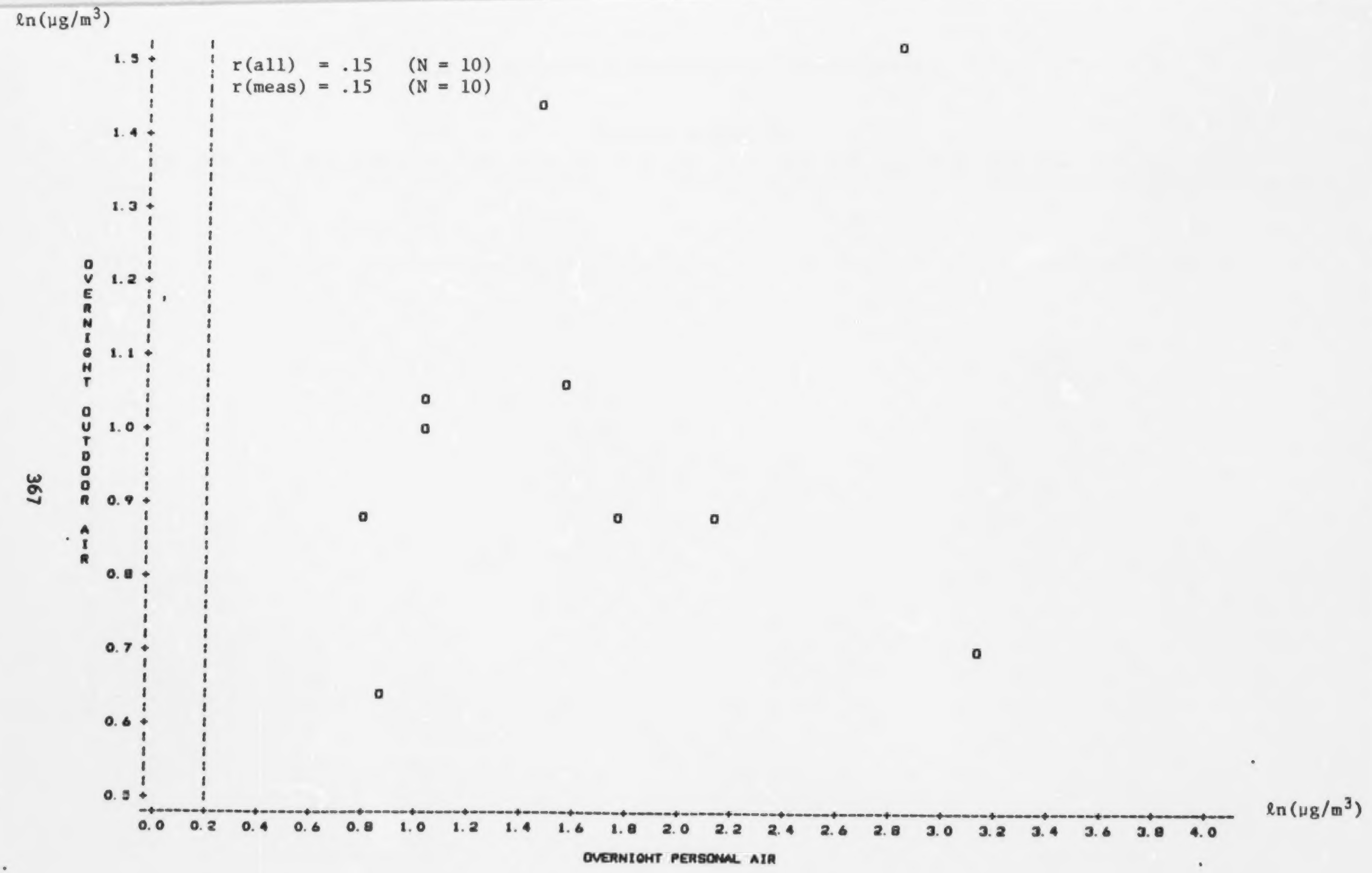

Figure 88. Benzene - Contra Costa.

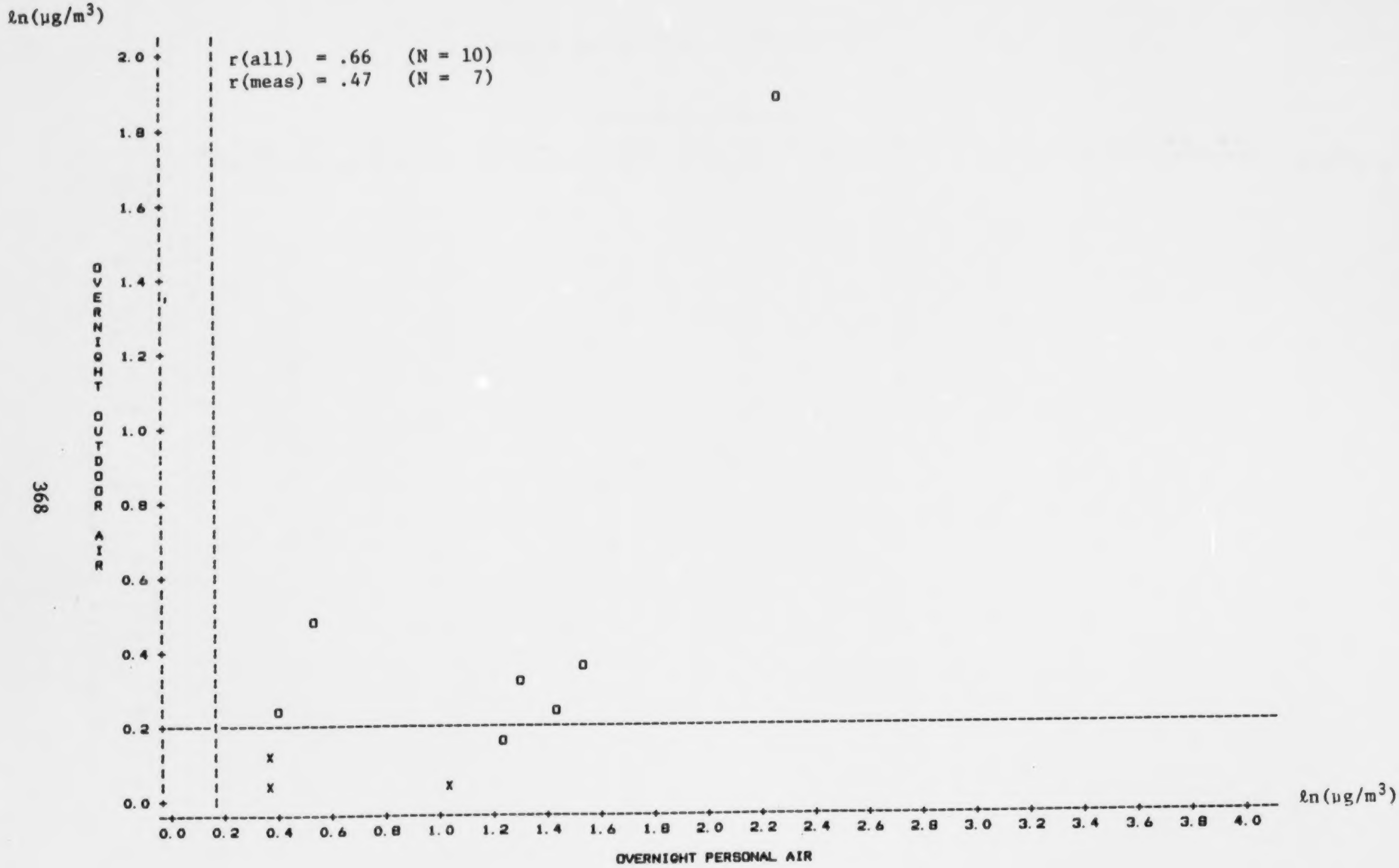

Figure 89. Tetrachloroethylene - Contra Costa.

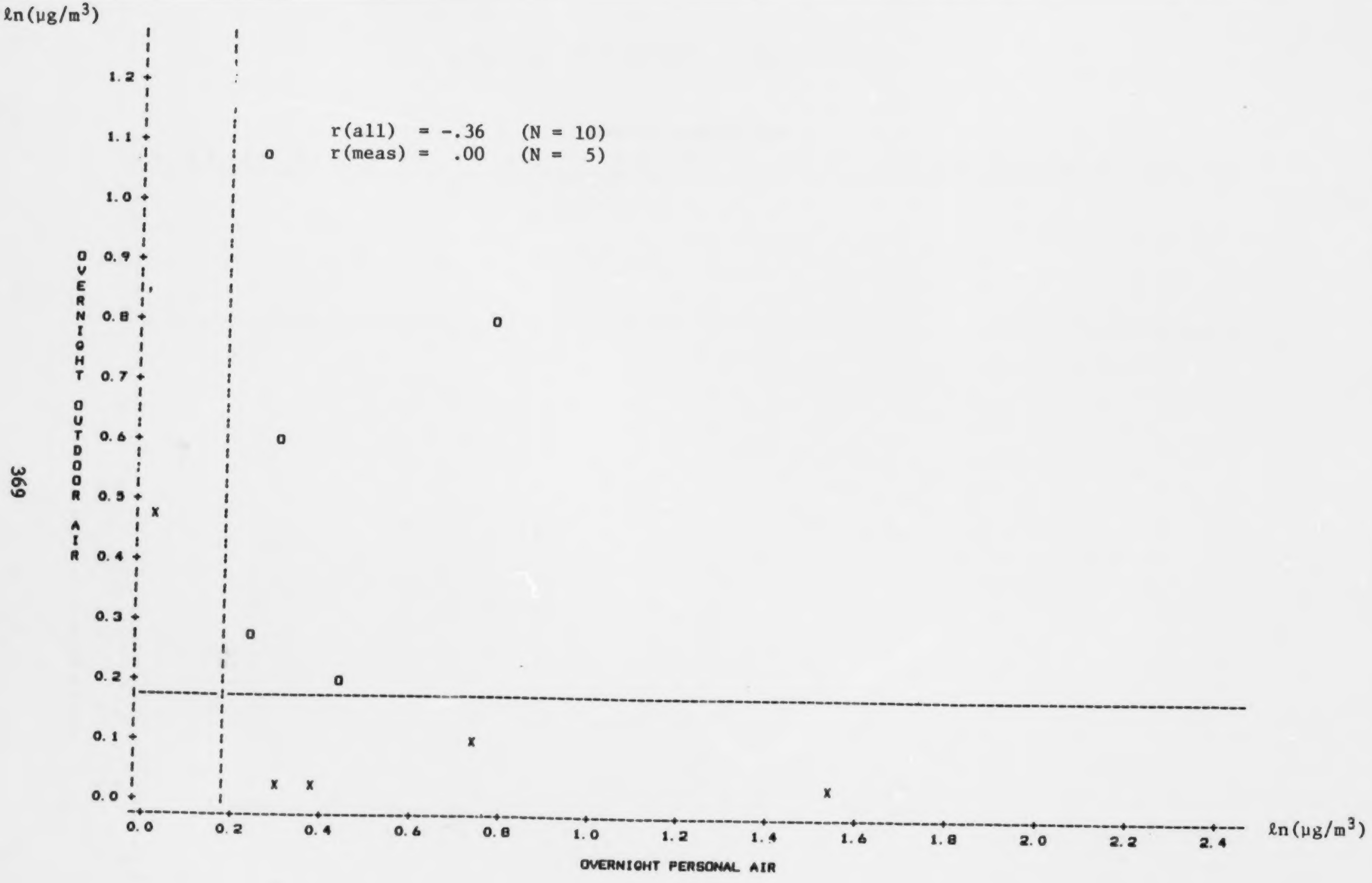

Figure 90. Styrene - Contra Costa.

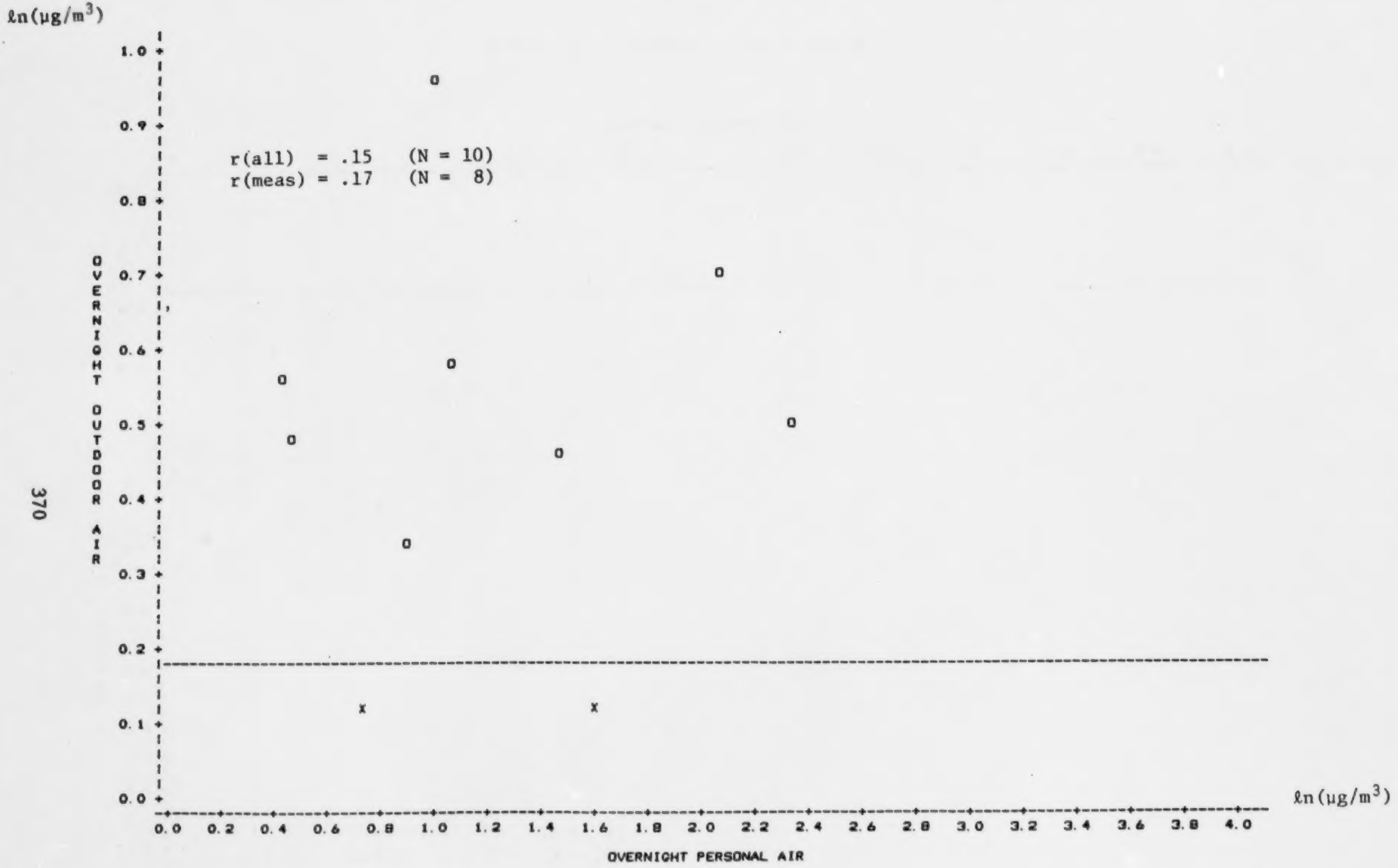

Figure 91. Ethylbenzene - Contra Costa.

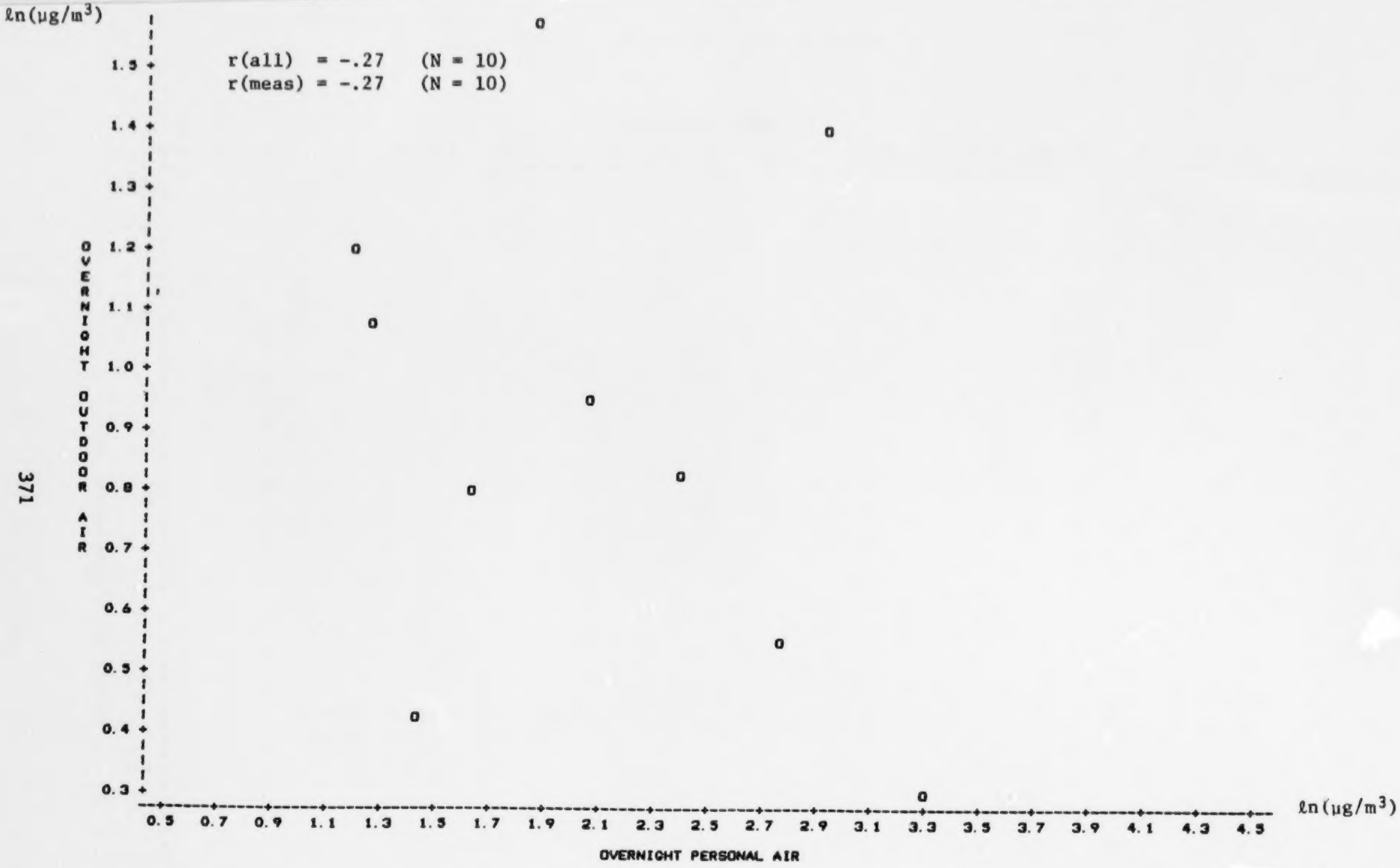

Figure 92. m,p-Xylene - Contra Costa.

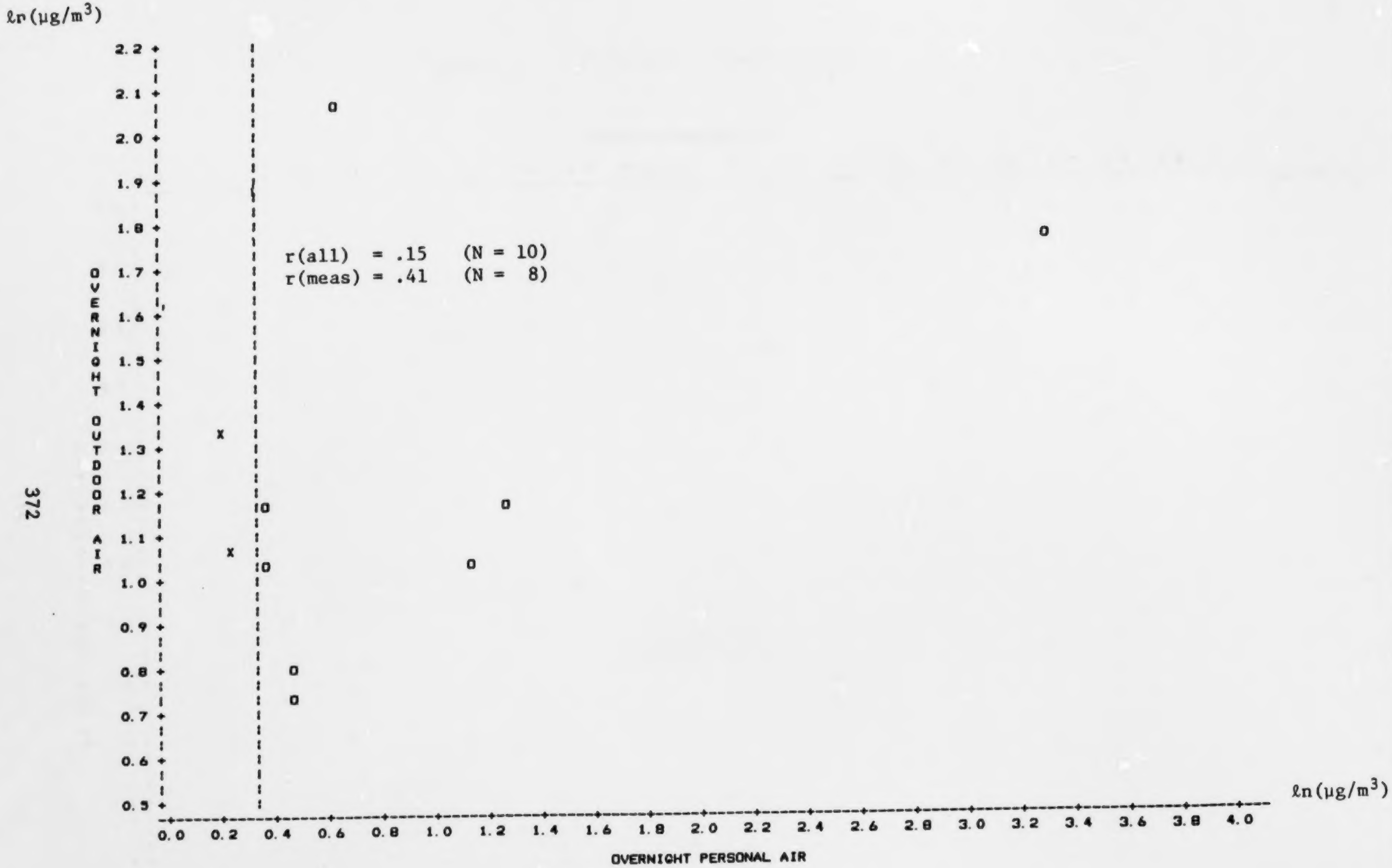

Figure 93. n-Decane - Contra Costa.

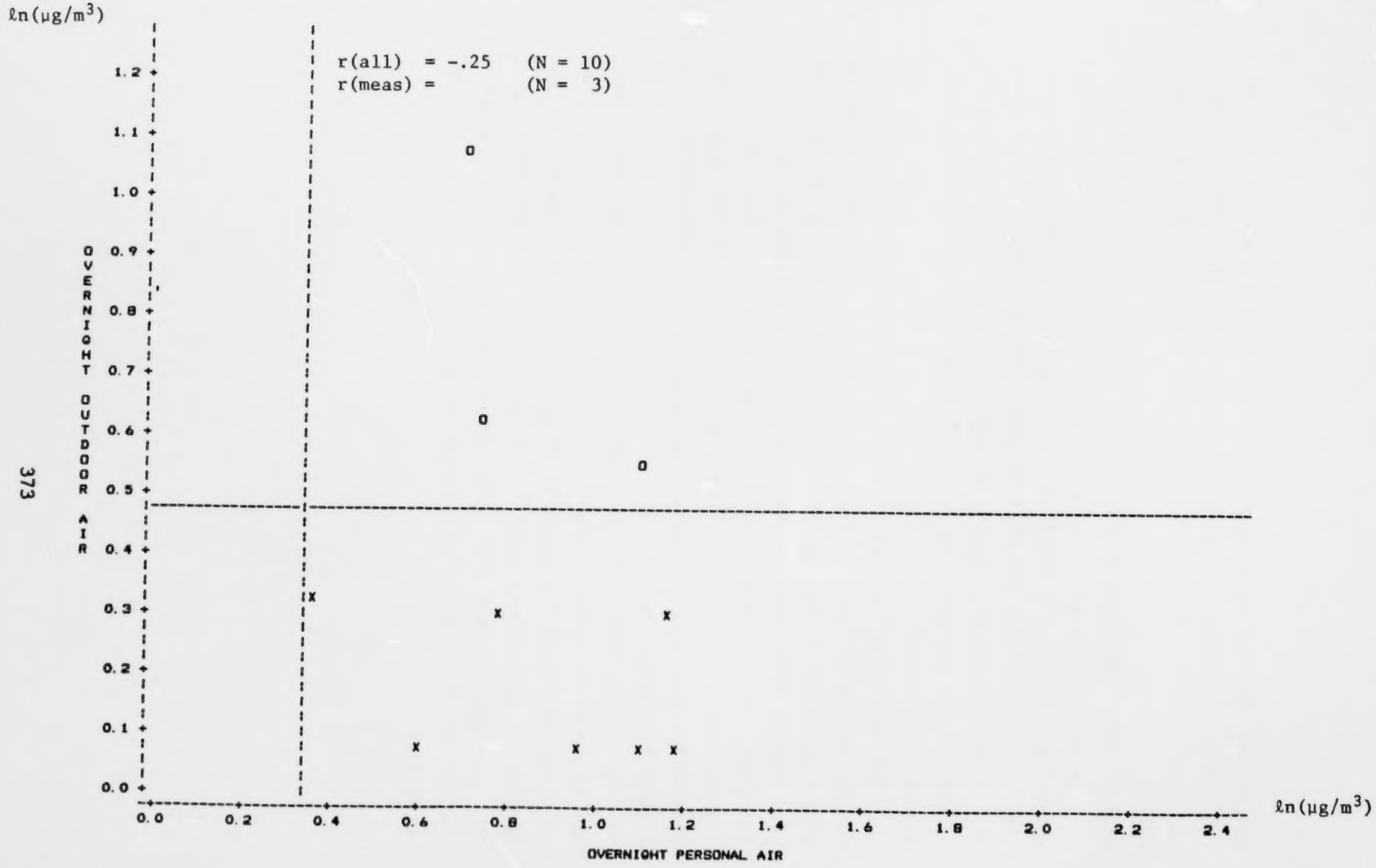

Figure 94. n-Octane - Contra Costa.

demonstrate the lack of strong correlation between the media and the relatively large variability in the data. Also, the limited sample sizes for outdoor air make any correlations with this media of limited value.

PERSONAL AIR VERSUS OUTDOOR AIR

Tables 164 through 166 compare overnight personal air to overnight outdoor air for the ten people who had fixed-site air monitors outside their homes. In Table 164 the unweighted percents measurable are given. For trichloroethylene, m,p-dichlorobenzene, n-dodecane, n-octane, n-undecane and a-pinene, the overnight personal air percentages were significantly higher.

The unweighted arithmetic means, arithmetic standard errors, medians and ranges are compared in Table 165. The arithmetic means for ethylbenzene, o-xylene, m,p-xylene, n-dodecane, n-octane, and a-pinene were significantly higher in personal air. The medians for 1,2-dichloroethane, 1,1,1-trichloroethane, benzene, carbon tetrachloride, trichloroethylene, tetrachloroethylene, ethylbenzene, o-xylene, m,p-xylene, n-dodecane, n-octane, n-undecane, and a-pinene were also significantly higher in overnight personal air.

To further examine the differences in medians and maximum values, the ratios of overnight personal air to overnight outdoor air are shown in Table 166. With the exception of chloroform and n-dodecane for the medians and o-dichlorobenzene for the maximums, the values were higher for overnight personal air. The median ratio of a-pinene and the maximum ratios for trichloroethylene and n-undecane appeared particularly high.

TABLE 164. UNWEIGHTED PERCENT OF CONCENTRATIONS MEASURABLE FOR THOSE PERSONS HAVING BOTH OVERNIGHT PERSONAL AIR AND OVERNIGHT OUTDOOR AIR - CONTRA COSTA

Compound	Overnight Personal Air	Overnight Outdoor Air
Chloroform	70.0	70.0
1,2-Dichloroethane	20.0	0.00
1,1,1-Trichloroethane	100.	100.
Benzene	100.	100.
Carbon Tetrachloride	90.0	90.0
Trichloroethylene	60.0*	10.0
Tetrachloroethylene	100.	70.0
Styrene	90.0	60.0
m,p-Dichlorobenzene	90.0*	40.0
o-Dichlorobenzene	20.0	20.0
Ethylbenzene	100.	80.0
o-Xylene	100.	90.0
m,p-Xylene	100.	100.
n-Decane	80.0	100.
n-Dodecane	70.0*	0.00
1,4-Dioxane	10.0	20.0
n-Octane	100. *	30.0
n-Undecane	90.0*	10.0
a-Pinene	100. *	10.0
Sample Size Range:	10	10

* T-test for difference between media significant at .05 level.

TABLE 165. UNWEIGHTED SUMMARY STATISTICS ($\mu g/m^3$) FOR THOSE PERSONS HAVING BOTH OVERNIGHT PERSONAL AIR AND OVERNIGHT OUTDOOR AIR -- CONTRA COSTA

	Overnight Personal Air				Overnight Outdoor Air			
Compound	Mean	S.E.	Median	Range	Mean	S.E.	Median	Range
Chloroform	1.31	0.62	0.38	0.02 - 6.30	0.55	0.15	0.58	0.02 - 1.50
1,2-Dichloroethane	0.13	0.04	0.12**	0.02 - 0.38	0.06	0.02	0.03	0.02 - 0.14
1,1,1-Trichloroethane	5.80	1.36	4.17**	1.50 - 14.0	3.01	0.76	2.12	1.60 - 9.60
Benzene	6.37	2.24	3.55**	1.20 - 22.0	1.83	0.28	1.55	0.88 - 3.60
Carbon Tetrachloride	1.03	0.30	0.70**	0.15 - 3.40	0.49	0.17	0.32	0.13 - 2.00
Trichloroethylene	0.93	0.42	0.39**	0.12 - 3.90	0.12	0.02	0.12	0.02 - 0.31
Tetrachloroethylene	2.46	0.80	2.10**	0.42 - 8.80	0.78	0.54	0.25	0.02 - 5.60
Styrene	0.83	0.34	0.41	0.03 - 3.70	0.52	0.20	0.28	0.02 - 1.90
m,p-Dichlorobenzene	1.27	0.72	0.44	0.16 - 7.55	0.36	0.08	0.25	0.15 - 1.05
o-Dichlorobenzene	0.12	0.05	0.03	0.02 - 0.49	0.11	0.06	0.02	0.02 - 0.58
Ethylbenzene	3.09*	0.93	1.80**	0.55 - 9.40	0.67	0.14	0.64	0.12 - 1.60
o-Xylene	3.70*	1.07	2.20**	0.87 - 11.0	0.54	0.13	0.46	0.02 - 1.50
m,p-Xylene	9.37*	2.50	6.25**	2.30 - 26.0	1.68	0.35	1.45	0.35 - 3.80
n-Decane	3.41	2.52	0.61	0.24 - 26.0	2.70	0.59	2.05	1.10 - 7.00
n-Dodecane	1.33*	0.47	0.57**	0.24 - 4.60	0.19	0.06	0.12	0.12 - 0.75
1,4-Dioxane	0.15	0.08	0.07	0.02 - 0.88	0.18	0.09	0.03	0.02 - 0.85
n-Octane	1.46*	0.20	1.40**	0.43 - 2.25	0.49	0.18	0.36	0.07 - 1.90
n-Undecane	2.98	1.50	0.92**	0.25 - 16.0	0.38	0.15	0.10	0.10 - 1.60
a-Pinene	1.36*	0.23	1.40**	0.42 - 2.80	0.12	0.07	0.05	0.05 - 0.75
Sample Size Range:			10				10	

* T-test for difference in means between media significant at .05 level.

** Wilcoxon signed rank test for difference in medians significant at .05 level.

TABLE 166. SUMMARY OF MEDIANS, MAXIMUM CONCENTRATIONS AND THEIR RATIOS FOR THOSE PERSONS HAVING OVERNIGHT PERSONAL AIR AND OVERNIGHT OUTDOOR AIR - CONTRA COSTA

Compound	Overnight Personal Air	Overnight Outdoor Air	Personal/ Outdoor Ratio
Chloroform	0.38 (6.30)*	0.58 (1.50)	0.66 (4.20)
1,2-Dichloroethane **	0.12 (0.38)	0.03 (0.14)	4.66 (2.64)
1,1,1-Trichloroethane **	4.17 (14.0)	2.12 (9.60)	1.96 (1.46)
Benzene **	3.55 (22.0)	1.55 (3.60)	2.29 (6.11)
Carbon Tetrachloride **	0.70 (3.40)	0.32 (2.00)	2.20 (1.70)
Trichloroethylene **	0.39 (3.90)	0.12 (0.31)	3.24 (12.6)
Tetrachloroethylene **	2.10 (8.80)	0.25 (5.60)	8.40 (1.57)
Styrene	0.41 (3.70)	0.28 (1.90)	1.49 (1.95)
m,p-Dichlorobenzene	0.44 (7.55)	0.25 (1.05)	1.77 (7.19)
o-Dichlorobenzene	0.03 (0.49)	0.02 (0.58)	1.03 (0.84)
Ethylbenzene **	1.80 (9.40)	0.64 (1.60)	2.79 (5.88)
o-Xylene **	2.20 (11.0)	0.46 (1.50)	4.73 (7.33)
m,p-Xylene **	6.25 (26.0)	1.45 (3.80)	4.31 (6.84)
n-Decane	0.61 (26.0)	2.05 (7.00)	0.30 (3.71)
n-Dodecane **	0.57 (4.60)	0.12 (0.75)	4.75 (6.13)
1,4-Dioxane	0.07 (0.88)	0.03 (0.85)	2.94 (1.04)
n-Octane **	1.40 (2.25)	0.36 (1.90)	3.90 (1.18)
n-Undecane **	0.92 (16.0)	0.10 (1.60)	9.02 (10.0)
a-Pinene **	1.40 (2.80)	0.05 (0.75)	28.7 (3.73)

* Median (Maximum)

** Wilcoxon signed rank test for difference in medians significant at .05 level.

COMPARISON BETWEEN SEASONS FOR LOS ANGELES

The study in Los Angeles County, California, monitored exposure to hazardous chemicals for a sample of individuals over two seasons. The first season of exposure monitoring was conducted during February and March of 1984. The second season sample consisted of a subsample of the people who participated in the first season study and was conducted in May and June of 1984. Data were collected on 117 people in the first season and 52 in the second. The following analysis was conducted on only those individuals who had data in both seasons. Therefore, second season weights were used in the comparison of the 52 people who had both first and second season data. The weights were adjusted for missing values as described earlier in the discussion of first season Los Angeles.

The sample size ranges are given for each media in Table 167. The fixed-site outdoor monitors were not set up at each home but only at one home per sample segment.

QUANTIFIABLE LIMITS

Tables 168 through 173 compared the quantifiable limits for those people with first and second season samples for breath, overnight personal air, daytime personal air, overnight outdoor air, daytime personal air, and water for the twenty-nine compounds analyzed. Overall, there seemed to be relatively little difference between the quantifiable limits for first and second seasons. The largest differences appeared to be for n-decane, n-dodecane, and n-undecane for personal and outdoor airs with second season quantifiable limits larger than those of first season. Also, for chlorobenzene in water, the first season quantifiable limits appeared about four times larger than those for second season.

PERCENTAGES ABOVE THE MAXIMUM QUANTIFIABLE LIMITS

The percentage of sample concentrations above the maximum quantifiable limit (max QL) for both first and second seasons is shown in Table 174 by media, season, and compound. In addition, a test of significance between the two season percentages is also included. The test was done on the percentage above the max QL rather than percent measurable because of the variation in the quantifiable limits between seasons. For breath the percentages for 1,1,1-trichloroethane, benzene, and

TABLE 167. DATA AVAILABLE FOR STATISTICAL ANALYSIS BY MEDIA FOR THOSE PERSONS HAVING BOTH FIRST AND SECOND SEASON LOS ANGELES SAMPLES

Media	Sample Size Ranges
Breath	49 - 51
Overnight Personal Air	48 - 51
Daytime Personal Air	47 - 50
Overnight Fixed-Site Outdoor Air	22 - 23
Daytime Fixed-Site Outdoor Air	22 - 24
Water	52

TABLE 168. UNWEIGHTED SUMMARY STATISTICS FOR QUANTIFIABLE LIMITS OF BREATH SAMPLES FOR THOSE PERSONS WITH FIRST AND SECOND SEASON LOS ANGELES DATA

	First Season		Second Season	
Compound	Median	Range	Median	Range
Chloroform	0.27	0.15 - 0.28	0.27	0.16 - 0.28
1,2-Dichloroethane	0.27	0.24 - 0.30	0.27	0.24 - 0.27
1,1,1-Trichloroethane	*		0.38	0.34 - 0.44
Benzene	0.26	0.26 - 0.26	0.27	0.16 - 0.27
Carbon Tetrachloride	0.27	0.24 - 0.30	0.27	0.16 - 0.33
Trichloroethylene	0.27	0.16 - 0.30	0.27	0.24 - 0.27
Bromodichloromethane	0.27	0.24 - 0.30	0.27	0.16 - 0.27
Dibromochloromethane	0.27	0.24 - 0.30	0.27	0.24 - 0.27
Tetrachloroethylene	*		*	
Chlorobenzene	0.27	0.16 - 0.30	0.27	0.16 - 0.27
Bromoform	0.27	0.16 - 0.30	0.27	0.24 - 0.27
Styrene	0.27	0.16 - 0.30	0.27	0.16 - 0.27
m,p-Dichlorobenzene	0.27	0.24 - 0.30	0.54	0.22 - 0.54
o-Dichlorobenzene	0.27	0.18 - 0.30	0.27	0.16 - 0.27
Ethylbenzene	0.27	0.24 - 0.30	0.27	0.16 - 0.27
o-Xylene	0.26	0.24 - 0.27	0.27	0.16 - 0.27
m,p-Xylene	*		*	
n-Decane	0.27	0.15 - 0.30	0.53	0.31 - 0.56
n-Dodecane	0.27	0.24 - 0.30	0.53	0.32 - 0.56
1,4-Dioxane	0.27	0.24 - 0.30	0.27	0.16 - 0.27
1,1,1,2-Tetrachloroethane	0.27	0.24 - 0.30	0.27	0.24 - 0.27
1,2-Dibromoethane	0.27	0.24 - 0.30	0.27	0.24 - 0.27
n-Octane	0.27	0.24 - 0.27	0.53	0.31 - 0.53
n-Undecane	0.27	0.24 - 0.30	0.52	0.32 - 0.56
1,1,2,2-Tetrachloroethane	0.27	0.16 - 0.30	0.27	0.24 - 0.27
a-Pinene	0.27	0.27 - 0.27	0.53	0.49 - 0.53

* 100% measurable

TABLE 169. UNWEIGHTED SUMMARY STATISTICS FOR QUANTIFIABLE LIMITS OF OVERNIGHT PERSONAL AIR SAMPLES FOR THOSE PERSONS WITH FIRST AND SECOND SEASON LOS ANGELES DATA

	First Season		Second Season	
Compound	Median	Range	Median	Range
Chloroform	0.19	0.19 - 0.19	0.22	0.20 - 0.25
1,2-Dichloroethane	0.19	0.12 - 0.23	0.20	0.18 - 0.22
1,1,1-Trichloroethane	0.29	0.29 - 0.29	*	
Benzene	*		0.20	0.19 - 0.21
Carbon Tetrachloride	0.19	0.19 - 0.19	0.24	0.22 - 0.26
Trichloroethylene	0.19	0.18 - 0.20	0.19	0.13 - 0.22
Tetrachloroethylene	*		0.21	0.21 - 0.22
Chlorobenzene	0.20	0.10 - 0.23	0.20	0.11 - 0.22
Styrene	0.20	0.20 - 0.20	0.19	0.18 - 0.22
m,p-Dichlorobenzene	0.19	0.18 - 0.20	0.40	0.24 - 0.42
o-Dichlorobenzene	0.19	0.16 - 0.23	0.20	0.18 - 0.26
Ethylbenzene	*		0.21	0.20 - 0.22
o-Xylene	*		0.20	0.20 - 0.21
m,p-Xylene	*		*	
n-Decane	0.19	0.17 - 0.19	0.77	0.72 - 0.85
n-Dodecane	0.19	0.19 - 0.20	0.98	0.89 - 1.10
1,4-Dioxane	0.38	0.11 - 0.48	0.20	0.18 - 0.22
1,1,1,2-Tetrachloroethane	0.31	0.17 - 0.48	0.20	0.18 - 0.22
1,2-Dibromoethane	0.19	0.16 - 0.23	0.20	0.18 - 0.22
n-Octane	0.20	0.20 - 0.20	0.62	0.56 - 0.66
n-Undecane	0.20	0.20 - 0.20	0.77	0.72 - 0.88
1,1,2,2-Tetrachloroethane	0.19	0.16 - 0.23	0.20	0.18 - 0.22
a-Pinene	0.47	0.20 - 0.74	0.37	0.36 - 0.44

* 100% measurable

TABLE 170. UNWEIGHTED SUMMARY STATISTICS FOR QUANTIFIABLE LIMITS OF DAYTIME PERSONAL AIR SAMPLES FOR THOSE PERSONS WITH FIRST AND SECOND SEASON LOS ANGELES DATA

Compound	First Season		Second Season	
	Median	Range	Median	Range
Chloroform	*		0.24	0.15 - 0.28
1,2-Dichloroethane	0.21	0.16 - 0.22	0.20	0.12 - 0.22
1,1,1-Trichloroethane	*		*	
Benzene	*		*	
Carbon Tetrachloride	0.22	0.22 - 0.22	0.22	0.22 - 0.22
Trichloroethylene	0.21	0.20 - 0.26	0.20	0.11 - 0.22
Tetrachloroethylene	*		0.20	0.20 - 0.20
Chlorobenzene	0.20	0.12 - 0.22	0.20	0.11 - 0.22
Styrene	0.21	0.21 - 0.21	0.20	0.17 - 0.22
m,p-Dichlorobenzene	0.18	0.18 - 0.18	0.26	0.25 - 0.44
o-Dichlorobenzene	0.21	0.16 - 0.22	0.20	0.17 - 0.22
Ethylbenzene	*		0.21	0.21 - 0.22
o-Xylene	*		0.20	0.20 - 0.22
m,p-Xylene	*		*	
n-Decane	0.21	0.20 - 0.22	0.78	0.70 - 0.89
n-Dodecane	0.21	0.21 - 0.21	1.00	0.88 - 1.12
1,4-Dioxane	0.36	0.16 - 0.44	0.20	0.17 - 0.22
1,1,1,2-Tetrachloroethane	0.22	0.16 - 0.44	0.20	0.17 - 0.22
1,2-Dibromoethane	0.20	0.16 - 0.22	0.20	0.17 - 0.22
n-Octane	0.18	0.16 - 0.19	0.59	0.52 - 0.62
n-Undecane	0.21	0.21 - 0.21	0.80	0.70 - 0.89
1,1,2,2-Tetrachloroethane	0.20	0.16 - 0.22	0.20	0.11 - 0.22
a-Pinene	0.82	0.72 - 0.89	0.40	0.36 - 0.44

* 100% measurable

TABLE 171. UNWEIGHTED SUMMARY STATISTICS FOR QUANTIFIABLE LIMITS OF OVERNIGHT OUTDOOR AIR SAMPLES FOR THOSE PERSONS WITH FIRST AND SECOND SEASON LOS ANGELES DATA

	First Season		Second Season	
Compound	Median	Range	Median	Range
Chloroform	0.18	0.17 - 0.20	0.20	0.11 - 0.26
1,2-Dichloroethane	0.18	0.17 - 0.20	0.19	0.11 - 0.22
1,1,1-Trichloroethane	*		*	
Benzene	*		*	
Carbon Tetrachloride	0.20	0.20 - 0.20	*	
Trichloroethylene	0.20	0.20 - 0.20	0.19	0.17 - 0.22
Tetrachloroethylene	0.18	0.18 - 0.18	*	
Chlorobenzene	0.18	0.11 - 0.21	0.19	0.11 - 0.22
Styrene	*		0.18	0.11 - 0.19
m,p-Dichlorobenzene	*		0.24	0.24 - 0.39
o-Dichlorobenzene	0.18	0.13 - 0.21	0.19	0.11 - 0.22
Ethylbenzene	*		*	
o-Xylene	*		*	
m,p-Xylene	*		*	
n-Decane	0.20	0.20 - 0.20	0.76	0.68 - 0.88
n-Dodecane	0.18	0.17 - 0.20	0.93	0.38 - 1.12
1,4-Dioxane	0.19	0.17 - 0.20	0.19	0.17 - 0.22
1,1,1,2-Tetrachloroethane	0.19	0.16 - 0.21	0.19	0.17 - 0.22
1,2-Dibromoethane	0.19	0.16 - 0.21	0.19	0.17 - 0.22
n-Octane	0.17	0.17 - 0.17	0.56	0.35 - 0.60
n-Undecane	0.20	0.20 - 0.20	0.74	0.47 - 0.82
1,1,2,2-Tetrachloroethane	0.19	0.11 - 0.21	0.19	0.17 - 0.22
a-Pinene	0.20	0.20 - 0.20	0.38	0.34 - 0.44

* 100% measurable

TABLE 172. UNWEIGHTED SUMMARY STATISTICS FOR QUANTIFIABLE LIMITS OF DAYTIME OUTDOOR AIR SAMPLES FOR THOSE PERSONS WITH FIRST AND SECOND SEASON LOS ANGELES DATA

	First Season		Second Season	
Compound	Median	Range	Median	Range
Chloroform	0.20	0.20 - 0.22	0.21	0.20 - 0.26
1,2-Dichloroethane	0.20	0.19 - 0.23	0.20	0.17 - 0.22
1,1,1-Trichloroethane	*		*	
Benzene	*		*	
Carbon Tetrachloride	*		*	
Trichloroethylene	0.19	0.19 - 0.20	0.19	0.13 - 0.22
Tetrachloroethylene	*		*	
Chlorobenzene	0.20	0.12 - 0.23	0.20	0.13 - 0.22
Styrene	0.21	0.20 - 0.22	0.20	0.20 - 0.20
m,p-Dichlorobenzene	0.20	0.19 - 0.22	0.24	0.21 - 0.27
o-Dichlorobenzene	0.20	0.19 - 0.23	0.20	0.12 - 0.22
Ethylbenzene	*		*	
o-Xylene	*		*	
m,p-Xylene	*		*	
n-Decane	0.19	0.19 - 0.19	0.78	0.43 - 0.82
n-Dodecane	0.20	0.19 - 0.22	0.96	0.38 - 1.00
1,4-Dioxane	0.20	0.19 - 0.23	0.20	0.17 - 0.22
1,1,1,2-Tetrachloroethane	0.20	0.19 - 0.23	0.20	0.17 - 0.22
1,2-Dibromoethane	0.20	0.19 - 0.23	0.20	0.17 - 0.22
n-Octane	0.22	0.22 - 0.22	0.58	0.33 - 0.62
n-Undecane	0.20	0.20 - 0.20	0.79	0.44 - 0.82
1,1,2,2-Tetrachloroethane	0.20	0.19 - 0.23	0.20	0.17 - 0.22
a-Pinene	0.20	0.19 - 0.22	0.39	0.34 - 0.44

* 100% measurable

TABLE 173. UNWEIGHTED SUMMARY STATISTICS FOR QUANTIFIABLE LIMITS OF WATER SAMPLES FOR THOSE PERSONS WITH FIRST AND SECOND SEASON LOS ANGELES DATA

	First Season		Second Season	
Compound	Median	Range	Median	Range
Chloroform	1.50	1.50 - 1.50	1.50	1.50 - 1.50
1,1,1-Trichloroethane	0.08	0.05 - 0.10	0.05	0.05 - 0.08
Trichloroethylene	0.07	0.05 - 0.30	0.05	0.05 - 0.05
Bromodichloromethane	0.30	0.30 - 0.30	0.30	0.30 - 0.30
Dibromochloromethane	0.25	0.25 - 0.25	0.30	0.30 - 0.30
Tetrachloroethylene	0.05	0.05 - 0.15	0.05	0.05 - 0.05
Chlorobenzene	0.18	0.09 - 0.38	0.05	0.05 - 0.08
Bromoform	0.55	0.24 - 0.55	0.30	0.30 - 0.30

TABLE 174. WEIGHTED PERCENT OF CONCENTRATIONS ABOVE THE MAXIMUM QUANTIFIABLE LIMIT FOR THOSE WITH FIRST AND SECOND SEASON LOS ANGELES DATA BY MEDIA

Compound	Breath		Overnight Personal Air		Daytime Personal Air	
	First Season	Second Season	First Season	Second Season	First Season	Second Season
Chloroform	24.8	33.3	95.5*	78.2	97.1*	52.0
1,2-Dichloroethane	10.7	2.57	60.2*	11.2	59.7*	21.1
1,1,1-Trichloroethane	100. *	84.6	97.8	100.	100.	100.
Benzene	99.4*	79.2	100.	98.9	100.	100.
Carbon Tetrachloride	2.31	11.6	97.2	98.9	98.5	99.4
Trichloroethylene	47.7	46.2	85.2*	58.0	87.4*	65.7
Bromodichloromethane	0.00	5.57	---	---	---	---
Dibromochloromethane	0.00	3.79	---	---	---	---
Tetrachloroethylene	100.	100.	100.	98.9	100.	99.4
Chlorobenzene	2.31	0.00	7.32	2.88	12.7	4.39
Bromoform	0.00	0.00	---	---	---	---
Styrene	44.7	34.8	97.7*	79.4	95.6	85.0
m,p-Dichlorobenzene	41.0	53.5	91.0	72.2	96.4*	72.0
o-Dichlorobenzene	12.7	0.00	24.8	16.6	20.2	6.20
Ethylbenzene	77.9	59.9	100.	96.6	100.	97.2
o-Xylene	90.4*	57.1	100.	96.9	100.	96.3
m,p-Xylene	100.	100.	100.	100.	100.	100.
n-Decane	33.9	24.8	79.7*	55.8	89.1	74.2
n-Dodecane	2.51	17.4*	65.5*	25.1	72.6*	41.3
1,4-Dioxane	1.68	0.00	33.5*	6.24	36.8*	16.2
1,1,1,2-Tetrachloroethane	0.00	0.00	0.00	0.00	2.94	3.54
1,2-Dibromoethane	0.00	0.00	2.53	0.66	5.80	0.00
n-Octane	49.9	54.8	97.7	92.2	94.9	93.4
n-Undecane	38.4	46.4	89.5*	57.7	93.6*	68.4
1,1,2,2-Tetrachloroethane	0.00	0.00	13.3	8.61	3.13	15.2
a-Pinene	91.4	79.1	92.4	77.3	80.5	60.3

continued

TABLE 174. continued

Compound	Overnight Outdoor Air		Daytime Outdoor Air		Water	
	First Season	Second Season	First Season	Second Season	First Season	Second Season
Chloroform	88.5*	31.0	62.7*	29.9	80.3	85.0
1,2-Dichloroethane	46.8*	0.00	9.12	0.00	---	---
1,1,1-Trichloroethane	100.	100.	100.	100.	41.1*	11.4
Benzene	100.	100.	100.	100.	---	---
Carbon Tetrachloride	91.6	100.	100.	100.	---	---
Trichloroethylene	88.5*	6.17	80.0*	4.71	0.00	9.11
Bromodichloromethane	---	---	---	---	90.2	92.5
Dibromochloromethane	---	---	---	---	88.1	85.0
Tetrachloroethylene	96.9	100.	100.	100.	7.77	0.00
Chlorobenzene	2.99	0.00	8.56	0.00	0.00	23.9
Bromoform	---	---	---	---	45.9	82.8*
Styrene	100.	83.7	92.4	83.4		
m,p-Dichlorobenzene	96.8*	66.0	84.6	69.2		
o-Dichlorobenzene	37.8	17.7	27.0	8.97		
Ethylbenzene	100.	100.	100.	100.		
o-Xylene	100.	100.	100.	100.		
m,p-Xylene	100.	100.	100.	100.		
n-Decane	91.6*	23.6	68.6*	33.6		
n-Dodecane	25.1	2.65	8.02	11.7		
1,4-Dioxane	70.1*	18.1	19.2	10.5		
1,1,1,2-Tetrachloroethane	0.00	4.69	0.00	0.00		
1,2-Dibromoethane	0.00	5.26	0.00	0.00		
n-Octane	93.8*	60.6	78.5*	39.1		
n-Undecane	84.9*	36.2	59.2*	28.9		
1,1,2,2-Tetrachloroethane	0.00	17.6*	0.00	3.04		
a-Pinene	96.8*	30.5	11.4	45.8*		

* Difference in percents significant at .05 level.

o-xylene were significantly higher in the first season (winter) while n-dodecane was significantly higher in the second (spring). For overnight personal air, the percentages for chloroform, 1,2-dichloroethane, trichloroethylene, styrene, n-decane, n-dodecane, 1,4-dioxane and n-undecane were significantly higher in the first season. For daytime personal air, chloroform, 1,2-dichlorobenzene, trichloroethylene, m,p-dichlorobenzene, n-dodecane, 1,4-dioxane, and n-undecane were significantly higher in first season. For overnight outdoor air, chloroform, 1,2-dichloroethane, trichloroethylene, m,p-dichlorobenzene, n-decane, 1,4-dioxane, n-octane, n-undecane, and a-pinene were significantly higher in the first season, while 1,1,2,2-tetrachloroethane was significantly higher in the second. For daytime outdoor air, chloroform, trichloroethylene, n-decane, n-octane, and n-undecane were significantly higher in the first season, while a-pinene was significantly higher in the second. For water, the percent above the maximum quantifiable limits for 1,1,1-trichloroethane was significantly higher in the first season, while the percent for bromoform was significantly higher in the second. Overall, the percentages that were significantly different were higher in the first season (winter) for breath and air.

The percents measurable (above the quantifiable limit) are shown in Table 175. These percentages also appear to be generally higher in the first season.

WEIGHTED SUMMARY STATISTICS

The weighted summary statistics for selected compounds by season and media are given in Tables 176 through 187. The statistics include median quantifiable limit, arithmetic mean, arithmetic standard error, geometric mean, geometric standard error, percentiles, and range. There appears to be a slight tendency for the concentration levels in the breath samples to be higher in the first season (winter) with the arithmetic mean for o-xylene and the geometric means for 1,1,1-trichloroethane, carbon tetrachloride, tetrachloroethylene, o-dichlorobenzene, ethylbenzene, and o-xylene significantly higher in the first season. However, the arithmetic mean for n-dodecane was significantly higher in the second season (spring).

For overnight personal air, the concentration levels appeared to be higher, overall, in the first season with all but three of the geometric

TABLE 175. WEIGHTED PERCENT MEASURABLE FOR THOSE WITH FIRST AND SECOND SEASON LOS ANGELES DATA BY MEDIA

Compound	Breath		Overnight Personal Air		Daytime Personal Air	
	First Season	Second Season	First Season	Second Season	First Season	Second Season
Chloroform	27.1	33.9	97.7	80.4	100.	57.8
1,2-Dichloroethane	10.7	2.57	64.6	11.2	74.4	23.4
1,1,1-Trichloroethane	100.	89.2	97.8	100.	100.	100.
Benzene	99.4	79.2	100.	98.9	100.	100.
Carbon Tetrachloride	5.15	11.6	97.7	98.9	98.5	99.4
Trichloroethylene	47.7	46.2	91.9	58.8	88.0	66.5
Bromodichloromethane	0.00	14.4	---	---	---	---
Dibromochloromethane	0.00	3.79	---	---	---	---
Tetrachloroethylene	100.	100.	100.	98.9	100.	99.4
Chlorobenzene	2.31	0.00	15.2	8.32	15.5	5.05
Bromoform	0.00	0.00	---	---	---	---
Styrene	47.4	37.9	97.7	79.4	95.6	85.0
m,p-Dichlorobenzene	68.4	60.0	94.7	86.6	99.4	82.8
o-Dichlorobenzene	14.9	0.00	31.7	19.6	26.3	6.20
Ethylbenzene	77.9	70.4	100.	96.6	100.	97.2
o-Xylene	94.4	57.1	100.	96.9	100.	96.3
m,p-Xylene	100.	100.	100.	100.	100.	100.
n-Decane	61.7	24.8	91.6	61.8	96.3	81.3
n-Dodecane	35.8	17.4	95.4	28.2	95.4	45.3
1,4-Dioxane	1.68	3.09	49.3	12.5	54.2	19.6
1,1,1,2-Tetrachloroethane	0.00	0.00	2.53	5.24	3.56	4.39
1,2-Dibromoethane	0.00	0.00	5.62	3.84	5.80	0.00
n-Octane	81.9	58.9	97.7	92.2	94.9	93.4
n-Undecane	66.8	49.1	97.7	62.4	97.7	73.9
1,1,2,2-Tetrachloroethane	0.00	0.61	13.3	10.9	3.13	15.2
a-Pinene	94.9	79.1	95.4	91.6	86.8	85.5
Sample Size Range:	49-51		48-51		47-50	

continued

TABLE 175. continued

Compound	Overnight Outdoor Air		Daytime Outdoor Air		Water	
	First Season	Second Season	First Season	Second Season	First Season	Second Season
Chloroform	93.7	31.0	74.7	33.5	95.6	85.6
1,2-Dichloroethane	59.6	0.00	17.3	4.99	---	---
1,1,1-Trichloroethane	100.	100.	100.	100.	52.1	13.6
Benzene	100.	100.	100.	100.	---	---
Carbon Tetrachloride	96.8	100.	100.	100.	---	---
Trichloroethylene	96.8	13.8	86.0	4.71	8.42	12.0
Bromodichloromethane	---	---	---	---	90.2	95.6
Dibromochloromethane	---	---	---	---	90.2	85.0
Tetrachloroethylene	97.0	100.	100.	100.	18.9	18.7
Chlorobenzene	9.77	0.00	8.56	0.00	19.9	4.71
Bromoform	---	---	---	---	66.7	89.5
Styrene	100.	83.7	92.4	94.2		
m,p-Dichlorobenzene	100.	77.2	88.5	69.2		
o-Dichlorobenzene	58.7	17.7	34.4	8.97		
Ethylbenzene	100.	100.	100.	100.		
o-Xylene	100.	100.	100.	100.		
m,p-Xylene	100.	100.	100.	100.		
n-Decane	96.8	44.2	95.7	46.4		
n-Dodecane	91.6	30.6	76.5	38.3		
1,4-Dioxane	73.7	21.2	22.8	18.7		
1,1,1,2-Tetrachloroethane	0.00	12.4	0.00	3.32		
1,2-Dibromoethane	0.00	13.0	0.00	0.00		
n-Octane	97.0	67.2	96.7	59.3		
n-Undecane	96.8	48.0	95.7	50.7		
1,1,2,2-Tetrachloroethane	0.00	17.6	0.00	11.2		
a-Pinene	96.8	46.2	57.7	54.0		
Sample Size Range:	22-23		22-24		52	

TABLE 176. WEIGHTED SUMMARY STATISTICS FOR SELECTED COMPOUNDS FOR BREATH ($\mu g/m^3$) - LOS ANGELES FIRST SEASON

Estimated Population: 332,615
Sample Size Range: 49-51

	a/ Mid. Q.L.	Arith. Mean	b/ Arith. S.E.	c/ Geo. Mean	d/ Geo. S.E.	Percentiles							Range
						16	25	Med.	75	84	90	95	
Chloroform	0.27	0.53	0.13	0.11	0.02	0.03	0.03	0.03	0.17	0.78	1.30	2.10	0.03 - 18.0
1,2-Dichloroethane	0.27	0.24	0.17	0.05	0.01	0.03	0.03	0.03	0.03	0.03	0.35	0.46	0.03 - 7.50
1,1,1-Trichloroethane	e/	14.7	4.83	6.67*	1.01	2.70	3.20	5.50	8.35	12.0	36.0	66.0	1.80 - 170.
Benzene	0.26	7.52	1.12	3.50	0.58	1.00	1.40	2.90	8.70	15.0	23.0	33.0	0.16 - 56.0
Carbon Tetrachloride	0.27	0.17	0.01	0.17*	0.01	0.16	0.17	0.17	0.17	0.17	0.18	0.30	0.03 - 0.38
Trichloroethylene	0.27	2.00	1.12	0.29	0.09	0.03	0.10	0.17	0.98	2.10	2.50	3.50	0.03 - 180.
Tetrachloroethylene	e/	15.5	5.69	7.07*	1.05	3.60	4.00	5.50	10.0	15.0	21.0	160.	1.60 - 170.
Styrene	0.27	1.11	0.26	0.23	0.08	0.03	0.03	0.17	1.70	2.60	3.70	6.20	0.03 - 7.70
m,p-Dichlorobenzene	0.27	5.18	2.10	0.79	0.25	0.17	0.17	0.46	1.50	4.70	7.60	35.0	0.15 - 62.0
o-Dichlorobenzene	0.27	0.17	0.07	0.06*	0.02	0.03	0.03	0.03	0.16	0.17	0.45	1.20	0.03 - 1.70
Ethylbenzene	0.27	1.56	0.27	0.80*	0.13	0.17	0.45	0.82	1.40	2.10	3.30	6.10	0.15 - 22.0
o-Xylene	0.26	1.02*	0.12	0.76*	0.11	0.30	0.40	0.81	1.20	1.70	2.40	2.80	0.15 - 5.60
m,p-Xylene	e/	3.61	0.50	2.33	0.35	0.94	1.10	2.35	3.90	5.30	8.90	12.0	0.35 - 39.0
n-Decane	0.27	0.73	0.19	0.28	0.09	0.03	0.04	0.40	0.63	1.30	1.80	3.40	0.03 - 5.00
n-Dodecane	0.27	0.23	0.02	0.20	0.02	0.17	0.17	0.17	0.35	0.36	0.40	0.41	0.03 - 0.57
1,4-Dioxane	0.27	0.06	0.02	0.04	0.00	0.03	0.03	0.03	0.03	0.03	0.04	0.16	0.03 - 1.10
n-Octane	0.27	0.92	0.28	0.51	0.10	0.17	0.28	0.50	0.85	1.30	1.40	2.00	0.03 - 16.0
n-Undecane	0.27	0.51	0.08	0.30	0.08	0.04	0.17	0.40	0.72	1.00	1.12	1.30	0.03 - 1.90
a-Pinene	0.27	1.58	0.24	1.10	0.15	0.57	0.65	1.10	1.70	2.70	4.00	4.80	0.17 - 8.70

a/ Mid. Q.L. = Median Quantifiable Limit
b/ Arith. S.E. = Standard Error of Arithmetic Mean
c/ Geo. Mean = Geometric Mean
d/ Geo. S.E. = Standard Error of Geometric Mean
e/ 100% measurable
* Arithmetic Mean or Geometric Mean significantly different between seasons at .05 level.

TABLE 177. WEIGHTED SUMMARY STATISTICS FOR SELECTED COMPOUNDS FOR BREATH ($\mu g/m^3$) - LOS ANGELES SECOND SEASON

Estimated Population: 332,615
Sample Size Range: 49-51

	a/ Mid. Q.L.	Arith. Mean	b/ Arith. S.E.	c/ Geo. Mean	d/ Geo. S.E.	Percentiles							Range
						16	25	Med.	75	84	90	95	
Chloroform	0.27	0.84	0.28	0.15	0.04	0.03	0.03	0.04	0.89	1.90	2.70	4.70	0.03 - 7.80
1,2-Dichloroethane	0.27	0.05	0.01	0.04	0.00	0.03	0.03	0.03	0.03	0.03	0.03	0.17	0.03 - 0.44
1,1,1-Trichloroethane	0.37	22.7	10.0	3.01	0.79	0.50	0.62	3.75	9.90	17.0	27.0	150.	0.04 - 280.
Benzene	0.27	8.82	1.29	2.29	0.82	0.03	0.69	4.20	8.81	19.0	24.0	36.0	0.03 - 85.0
Carbon Tetrachloride	0.27	0.25	0.13	0.10	0.02	0.03	0.04	0.17	0.17	0.18	0.36	0.54	0.03 - 3.20
Trichloroethylene	0.27	0.98	0.30	0.20	0.06	0.03	0.03	0.17	1.00	1.60	2.20	3.70	0.03 - 35.0
Tetrachloroethylene	e/	9.14	2.76	4.40	0.81	1.60	2.60	4.00	5.50	13.0	23.5	38.0	0.44 - 81.0
Styrene	0.27	0.90	0.36	0.18	0.05	0.03	0.03	0.17	0.83	1.50	2.60	32.0	0.03 - 13.0
m,p-Dichlorobenzene	0.54	2.95	1.16	0.67	0.19	0.14	0.21	0.60	1.67	2.27	8.77	21.3	0.07 - 35.8
o-Dichlorobenzene	0.27	0.04	0.00	0.04	0.00	0.03	0.03	0.03	0.03	0.03	0.03	0.10	0.03 - 0.17
Ethylbenzene	0.27	1.06	0.15	0.55	0.08	0.17	0.17	0.54	1.20	2.70	3.50	3.60	0.10 - 11.0
o-Xylene	0.27	0.73	0.08	0.41	0.07	0.17	0.17	0.46	1.20	1.60	1.60	1.80	0.03 - 3.70
m,p-Xylene	e/	2.76	0.28	1.81	0.21	0.81	0.88	1.40	4.30	5.90	6.30	7.70	0.40 - 18.0
n-Decane	0.53	0.51	0.15	0.26	0.02	0.07	0.07	0.33	0.34	0.70	0.70	1.10	0.07 - 25.0
n-Dodecane	0.53	0.36*	0.05	0.24	0.04	0.07	0.07	0.33	0.33	0.59	0.69	0.77	0.06 - 3.40
1,4-Dioxane	0.27	0.05	0.01	0.04	0.00	0.03	0.03	0.03	0.03	0.07	0.17	0.17	0.03 - 0.17
n-Octane	0.53	1.16	0.25	0.65	0.06	0.33	0.33	0.76	1.20	1.50	1.80	2.70	0.07 - 43.0
n-Undecane	0.52	0.67	0.16	0.29	0.05	0.07	0.07	0.33	0.77	1.10	1.30	1.70	0.06 - 23.0
a-Pinene	0.53	1.73	0.28	0.99	0.13	0.33	0.59	0.93	1.60	2.20	5.20	6.20	0.07 - 11.0

a/ Mid. Q.L. = Median Quantifiable Limit
b/ Arith. S.E. = Standard Error of Arithmetic Mean
c/ Geo. Mean = Geometric Mean
d/ Geo. S.E. = Standard Error of Geometric Mean
e/ 100% measurable
* Arithmetic Mean or Geometric Mean significantly different between seasons at .05 level.

TABLE 178. WEIGHTED SUMMARY STATISTICS FOR SELECTED COMPOUNDS FOR OVERNIGHT PERSONAL AIR ($\mu g/m^3$) - LOS ANGELES FIRST SEASON

Estimated Population: 332,615
Sample Size Range: 48-51

	a/ Mid. Q.L.	Arith. Mean	b/ Arith. S.E.	c/ Geo. Mean	d/ Geo. S.E.	Percentiles							Range
						16	25	Med.	75	84	90	95	
Chloroform	0.19	2.21	0.41	1.43*	0.28	0.68	0.70	1.30	3.40	4.15	5.70	6.50	0.12 - 9.70
1,2-Dichloroethane	0.19	1.74	1.41	0.24*	0.06	0.12	0.13	0.27	0.42	0.51	0.68	1.40	0.02 - 51.0
1,1,1-Trichloroethane	0.29	32.5 *	4.89	21.2 *	4.83	12.0	19.0	24.0	38.0	50.0	62.0	63.0	0.04 - 183.
Benzene	e/	14.6 *	1.31	12.4 *	1.45	7.50	10.5	14.0	18.0	20.0	26.0	34.0	2.20 - 39.0
Carbon Tetrachloride	0.19	0.68	0.06	0.62	0.06	0.46	0.51	0.59	0.78	0.97	1.00	1.10	0.12 - 2.20
Trichloroethylene	0.19	3.07	0.81	1.09*	0.33	0.26	0.37	1.10	4.50	5.95	6.60	6.90	0.02 - 33.0
Tetrachloroethylene	e/	13.1 *	2.44	8.08*	1.09	4.55	5.60	6.80	11.0	18.0	23.0	69.0	0.81 - 77.0
Styrene	0.20	3.50*	0.41	2.48*	0.49	1.30	1.80	2.65	5.20	6.00	8.20	8.90	0.03 - 9.20
m,p-Dichlorobenzene	0.18	20.4	10.4	2.42*	0.78	0.59	0.79	1.80	5.80	13.0	54.0	76.0	0.03 - 430.
o-Dichlorobenzene	0.19	0.35	0.12	0.11*	0.03	0.02	0.03	0.12	0.25	0.35	1.15	2.30	0.02 - 3.30
Ethylbenzene	e/	8.14	0.99	6.46*	0.88	3.10	4.80	6.70	10.0	12.0	15.0	22.8	1.10 - 29.0
o-Xylene	e/	10.3*	1.17	8.46*	1.10	4.20	7.00	8.70	13.0	15.0	20.0	25.0	1.20 - 34.0
m,p-Xylene	e/	21.7	1.95	18.8*	1.90	12.0	15.5	20.0	27.0	31.0	41.0	44.0	4.10 - 58.0
n-Decane	0.19	2.83	0.46	1.47	0.34	0.41	0.95	2.20	3.00	5.10	6.91	11.0	0.02 - 12.0
n-Dodecane	0.19	2.28	0.32	1.44*	0.29	0.66	0.91	1.60	3.10	4.40	5.80	7.30	0.03 - 8.80
1,4-Dioxane	0.38	0.45	0.11	0.20*	0.05	0.05	0.05	0.24	0.53	0.62	0.95	2.10	0.02 - 3.60
n-Octane	0.20	4.95	1.09	3.14*	0.65	1.80	2.00	3.50	5.40	6.00	8.90	10.2	0.03 - 38.0
n-Undecane	0.20	4.08	0.76	2.48*	0.45	1.20	1.60	2.40	3.80	6.80	10.0	16.0	0.13 - 22.0
a-Pinene	0.74	5.28	1.15	2.92	0.70	1.42	1.80	2.80	4.30	7.20	16.0	28.0	0.03 - 30.0

a/ Mid. Q.L. = Median Quantifiable Limit
b/ Arith. S.E. = Standard Error of Arithmetic Mean
c/ Geo. Mean = Geometric Mean
d/ Geo. S.E. = Standard Error of Geometric Mean
e/ 100% measurable
* Arithmetic Mean or Geometric Mean significantly different between seasons at .05 level.

TABLE 179. WEIGHTED SUMMARY STATISTICS FOR SELECTED COMPOUNDS FOR OVERNIGHT PERSONAL AIR ($\mu g/m^3$) - LOS ANGELES SECOND SEASON

Estimated Population: 332,615
Sample Size Range: 48-51

	a/ Mid. Q.L.	Arith. Mean	b/ Arith. S.E.	c/ Geo. Mean	d/ Geo. S.E.	Percentiles							Range
						16	25	Med.	75	84	90	95	
Chloroform	0.22	1.57	0.48	0.59	0.16	0.14	0.28	0.67	1.40	2.40	5.20	5.30	0.03 - 20.0
1,2-Dichloroethane	0.20	0.12	0.03	0.06	0.01	0.02	0.02	0.03	0.13	0.13	0.24	0.59	0.02 - 1.05
1,1,1-Trichloroethane	e/	13.5	3.52	8.61	0.96	4.50	6.10	7.20	11.0	14.0	17.0	24.0	1.90 - 360.
Benzene	0.21	7.78	1.31	4.69	0.76	1.80	2.20	4.45	9.00	15.0	25.0	29.0	0.02 - 35.0
Carbon Tetrachloride	0.26	0.71	0.07	0.64	0.04	0.52	0.52	0.65	0.73	0.82	0.89	0.89	0.14 - 3.60
Trichloroethylene	0.20	2.02	1.08	0.28	0.09	0.03	0.08	0.34	0.88	1.80	2.50	6.40	0.02 - 170.
Tetrachloroethylene	0.22	4.02	1.62	1.97	0.36	0.79	1.10	1.90	3.30	3.60	4.60	9.75	0.03 - 56.0
Styrene	0.19	1.11	0.14	0.52	0.10	0.03	0.38	0.74	1.60	1.90	2.70	3.20	0.02 - 5.30
m,p-Dichlorobenzene	0.25	14.1	5.89	1.32	0.42	0.28	0.42	0.84	2.75	16.6	23.0	110.	0.05 - 250.
o-Dichlorobenzene	0.20	0.47	0.34	0.06	0.01	0.02	0.02	0.03	0.13	0.28	0.30	1.30	0.02 - 11.0
Ethylbenzene	0.20	5.54	1.58	2.85	0.65	1.23	1.50	2.50	4.80	7.70	22.0	23.0	0.03 - 35.0
o-Xylene	0.20	5.73	1.62	2.55	0.72	0.95	1.60	2.55	5.20	9.20	24.0	29.0	0.03 - 30.0
m,p-Xylene	e/	18.4	4.81	10.2	2.15	4.20	5.70	8.70	15.0	29.0	70.0	92.0	0.60 - 94.0
n-Decane	0.80	3.31	1.83	0.90	0.19	0.45	0.47	1.10	1.50	2.10	5.30	6.10	0.09 - 77.0
n-Dodecane	0.98	2.27	1.21	0.62	0.14	0.13	0.13	0.61	1.40	2.55	3.00	6.20	0.12 - 57.0
1,4-Dioxane	0.20	0.16	0.07	0.04	0.01	0.02	0.02	0.03	0.03	0.11	0.33	0.96	0.02 - 4.20
n-Octane	0.61	2.85	0.72	1.78	0.31	0.88	1.10	1.90	2.80	3.00	4.40	13.0	0.07 - 20.0
n-Undecane	0.77	4.52	2.32	1.13	0.20	0.46	0.48	1.10	2.20	2.40	4.10	4.70	0.10 - 76.0
a-Pinene	0.37	5.75	1.33	2.17	0.62	0.52	0.82	1.80	5.60	11.0	17.0	29.0	0.05 - 31.0

a/ Mid. Q.L. = Median Quantifiable Limit
b/ Arith. S.E. = Standard Error of Arithmetic Mean
c/ Geo. Mean = Geometric Mean
d/ Geo. S.E. = Standard Error of Geometric Mean
e/ 100% measurable
* Arithmetic Mean or Geometric Mean significantly different between seasons at .05 level.

TABLE 180. WEIGHTED SUMMARY STATISTICS FOR SELECTED COMPOUNDS FOR DAYTIME PERSONAL AIR ($\mu g/m^3$) - LOS ANGELES FIRST SEASON

Estimated Population: 332,615
Sample Size Range: 47-50

	a/ Mid. Q.L.	Arith. Mean	b/ Arith. S.E.	c/ Geo. Mean	d/ Geo. S.E.	Percentiles 16	25	Med.	75	84	90	95	Range
Chloroform	e/	1.84*	0.44	1.01*	0.13	0.46	0.53	0.98	1.70	2.20	2.80	3.60	0.22 - 92.0
1,2-Dichloroethane	0.21	0.41*	0.10	0.26*	0.04	0.13	0.14	0.26	0.45	0.52	0.66	0.70	0.02 - 3.60
1,1,1-Trichloroethane	e/	150.	102.	31.0*	5.67	11.0	14.0	24.0	60.0	68.0	180.	360.	3.00 - 3990
Benzene	e/	[illegible]9.5 *	2.75	15.2*	1.88	8.50	9.40	13.0	24.0	31.0	35.0	58.0	4.00 - 86.0
Carbon Tetrachloride	0.22	0.79	0.10	0.68	0.06	0.50	0.59	0.68	0.77	0.94	1.10	1.60	0.03 - 4.00
Trichloroethylene	0.21	11.9	3.26	2.13*	0.74	0.29	0.41	2.10	8.10	28.0	37.0	78.0	0.03 - 100.
Tetrachloroethylene	e/	23.9	6.62	10.6*	1.82	3.85	4.70	8.20	18.0	23.0	71.0	100.	1.20 - 200.
Styrene	0.21	3.64*	0.59	2.44*	0.47	1.35	1.60	2.40	3.80	6.35	6.40	16.0	0.13 - 19.0
m,p-Dichlorobenzene	0.18	16.6	5.59	3.11*	0.81	0.76	0.98	1.60	6.90	30.2	71.0	120.	0.11 - 162.
o-Dichlorobenzene	0.20	0.28*	0.11	0.08*	0.02	0.03	0.03	0.03	0.14	0.60	0.79	0.89	0.02 - 3.20
Ethylbenzene	e/	15.2 *	3.24	8.97*	1.63	3.50	4.00	8.30	15.0	23.0	35.0	66.0	1.40 - 132.
o-Xylene	e/	17.4 *	3.20	11.8 *	1.88	5.50	5.90	9.70	19.0	36.0	45.0	65.0	2.40 - 83.0
m,p-Xylene	e/	35.1	5.87	25.2 *	3.60	12.0	14.0	22.0	39.0	57.0	71.0	100.	6.10 - 220.
n-Decane	0.20	13.5	6.66	2.98	0.80	1.00	1.50	2.48	5.90	7.70	14.0	125.	0.03 - 140.
n-Dodecane	0.21	3.95	1.13	1.96*	0.40	0.65	1.00	1.81	3.40	5.00	6.60	20.0	0.13 - 27.0
1,4-Dioxane	0.37	19.4	18.2	0.27*	0.10	0.05	0.05	0.25	0.87	1.30	2.30	22.1	0.02 - 710.
n-Octane	0.16	8.54	2.06	3.89	0.97	2.10	2.90	3.90	7.70	17.0	17.0	28.0	0.02 - 180.
n-Undecane	0.21	10.7	4.87	3.50*	0.85	1.10	1.50	2.60	6.80	8.60	15.0	61.0	0.13 - 103.
a-Pinene	0.82	3.18	0.40	1.91	0.27	0.56	1.00	1.95	3.90	5.50	7.50	11.0	0.10 - 18.0

a/ Mid. Q.L. = Median Quantifiable Limit
b/ Arith. S.E. = Standard Error of Arithmetic Mean
c/ Geo. Mean = Geometric Mean
d/ Geo. S.E. = Standard Error of Geometric Mean
e/ 100% measurable
* Arithmetic Mean or Geometric Mean significantly different between seasons at .05 level.

TABLE 181. WEIGHTED SUMMARY STATISTICS FOR SELECTED COMPOUNDS FOR DAYTIME PERSONAL AIR (μg/m³) - LOS ANGELES SECOND SEASON

Estimated Population: 332,615
Sample Size Range: 47-50

	a/ Mid. Q.L.	Arith. Mean	b/ Arith. S.E.	c/ Geo. Mean	d/ Geo. S.E.	Percentiles							Range
						16	25	Med.	75	84	90	95	
Chloroform	0.23	0.70	0.17	0.21	0.60	0.03	0.03	0.29	0.92	1.10	1.60	3.40	0.02 - 12.0
1,2-Dichloroethane	0.20	0.12	0.03	0.06	0.01	0.02	0.02	0.03	0.13	0.27	0.30	0.32	0.02 - 0.66
1,1,1-Trichloroethane	e/	77.2	39.0	18.8	3.67	5.60	6.60	11.0	56.0	91.0	130.	150.	1.60 - 1600
Benzene	e/	10.6	1.61	6.94	0.93	2.57	3.50	7.20	12.0	19.0	25.0	34.0	1.30 - 54.0
Carbon Tetrachloride	0.22	0.90	0.24	0.69	0.06	0.51	0.55	0.67	0.77	0.87	0.96	1.10	0.03 - 9.20
Trichloroethylene	0.20	11.2	3.26	0.81	0.32	0.02	0.03	1.20	5.50	19.0	25.0	61.0	0.02 - 350.
Tetrachloroethylene	0.20	27.1	15.7	4.34	0.92	1.50	2.00	3.40	7.50	9.10	16.0	190.	0.03 - 520.
Styrene	0.19	2.33	0.45	0.94	0.20	0.30	0.47	1.50	2.70	3.60	5.10	12.0	0.02 - 13.0
m,p-Dichlorobenzene	0.25	10.1	4.06	1.18	0.33	0.16	0.34	0.86	3.04	5.05	20.0	54.0	0.05 - 150.
o-Dichlorobenzene	0.20	0.10	0.05	0.04	0.01	0.02	0.02	0.03	0.03	0.11	0.13	0.63	0.02 - 1.40
Ethylbenzene	0.22	8.81	1.29	5.11	0.85	2.10	2.30	6.00	11.5	17.0	19.0	25.0	0.13 - 87.0
o-Xylene	0.20	8.11	1.38	3.90	0.87	1.30	1.90	4.00	11.0	14.0	20.0	31.0	0.03 - 69.0
m,p-Xylene	e/	28.1	4.37	17.0	2.83	6.50	7.80	18.0	37.0	52.0	76.0	80.0	0.55 - 190.
n-Decane	0.76	3.68	0.74	1.73	0.25	0.49	0.84	1.80	3.50	5.70	6.60	8.20	0.10 - 110.
n-Dodecane	0.99	1.94	0.65	0.84	0.13	0.14	0.59	0.69	1.60	1.70	2.80	9.20	0.11 - 28.0
1,4-Dioxane	0.20	3.50	3.32	0.06	0.02	0.02	0.02	0.03	0.03	0.45	0.61	1.50	0.02 - 130.
n-Octane	0.59	5.50	1.39	2.96	0.43	1.32	2.00	3.20	4.90	7.40	7.70	12.0	0.33 - 170.
n-Undecane	0.79	3.95	1.09	1.44	0.25	0.48	0.54	1.25	2.10	3.90	8.90	19.0	0.10 - 100.
a-Pinene	0.40	7.28	3.40	1.30	0.31	0.33	0.50	1.40	2.60	3.80	11.0	36.0	0.05 - 140.

a/ Mid. Q.L. = Median Quantifiable Limit
b/ Arith. S.E. = Standard Error of Arithmetic Mean
c/ Geo. Mean = Geometric Mean
d/ Geo. S.E. = Standard Error of Geometric Mean
e/ 100% measurable
* Arithmetic Mean or Geometric Mean significantly different between seasons at .05 level.

TABLE 182. WEIGHTED SUMMARY STATISTICS FOR SELECTED COMPOUNDS FOR OVERNIGHT OUTDOOR AIR ($\mu g/m^3$) - LOS ANGELES FIRST SEASON

Estimated Population: 332,615
Sample Size Range: 22-23

	a/ Mid. Q.L.	Arith. Mean	b/ Arith. S.E.	c/ Geo. Mean	d/ Geo. S.E.	Percentiles 16	25	Med.	75	84	90	95	Range
Chloroform	0.20	1.14*	0.39	0.66*	0.16	0.27	0.39	0.68	1.10	1.50	1.90	5.90	0.03 - 5.90
1,2-Dichloroethane	0.18	0.24*	0.05	0.15*	0.04	0.02	0.11	0.22	0.35	0.40	0.51	0.60	0.02 - 1.30
1,1,1-Trichloroethane	e/	42.5 *	7.31	30.9 *	5.26	13.0	19.0	31.0	59.0	67.0	67.0	140.	1.70 - 190.
Benzene	e/	19.3 *	1.73	17.4 *	1.73	11.0	13.0	19.0	25.0	26.0	32.0	33.0	3.20 - 33.0
Carbon Tetrachloride	0.20	0.76	0.07	0.67	0.07	0.55	0.60	0.66	0.93	1.20	1.30	1.40	0.13 - 1.50
Trichloroethylene	0.20	0.93*	0.18	0.70*	0.13	0.29	0.40	0.67	1.30	1.50	2.00	2.30	0.13 - 3.00
Tetrachloroethylene	0.18	11.6 *	2.18	7.42*	1.89	4.16	4.70	7.35	16.0	23.0	24.0	28.0	0.02 - 34.0
Styrene	e/	4.42*	0.66	3.26*	0.78	1.50	2.25	4.20	6.30	7.40	8.30	9.30	0.33 - 9.30
m,p-Dichlorobenzene	e/	2.69*	0.70	1.85*	0.35	0.83	1.50	1.70	3.10	4.10	4.50	5.90	0.28 - 21.0
o-Dichlorobenzene	0.19	0.23	0.03	0.19*	0.03	0.11	0.12	0.21	0.30	0.42	0.32	0.50	0.03 - 0.55
Ethylbenzene	e/	11.5 *	1.24	10.1*	1.23	6.95	7.80	11.0	13.0	18.0	20.0	21.0	1.30 - 26.0
o-Xylene	e/	12.6 *	1.35	11.2 *	1.30	7.60	8.20	11.0	14.6	21.0	22.0	22.0	1.50 - 28.0
m,p-Xylene	e/	28.8 *	2.23	26.6 *	2.40	17.5	23.0	30.0	32.0	42.0	43.0	43.0	4.50 - 52.0
n-Decane	0.20	4.78*	1.89	2.72*	0.69	1.20	1.31	2.60	4.90	5.50	5.90	27.0	0.13 - 27.0
n-Dodecane	0.17	0.99	0.25	0.70*	0.16	0.32	0.40	0.76	1.20	1.30	1.60	3.70	0.11 - 3.70
1,4-Dioxane	0.19	0.51*	0.15	0.25*	0.07	0.03	0.12	0.29	0.56	0.80	1.10	1.40	0.02 - 4.60
n-Octane	0.17	4.61*	0.70	3.45*	0.70	2.00	2.20	4.30	6.60	7.90	9.80	10.0	0.11 - 12.0
n-Undecane	0.20	3.55	1.32	2.06*	0.52	0.96	1.10	2.20	3.70	3.80	4.90	19.0	0.13 - 19.0
a-Pinene	0.20	1.34*	0.23	1.04*	0.16	0.56	0.67	0.89	1.80	2.10	2.90	4.40	0.13 - 4.80

a/ Mid. Q.L. = Median Quantifiable Limit
b/ Arith. S.E. = Standard Error of Arithmetic Mean
c/ Geo. Mean = Geometric Mean
d/ Geo. S.E. = Standard Error of Geometric Mean
e/ 100% measurable
* Arithmetic Mean or Geometric Mean significantly different between seasons at .05 level.

TABLE 183. WEIGHTED SUMMARY STATISTICS FOR SELECTED COMPOUNDS FOR OVERNIGHT OUTDOOR AIR ($\mu g/m^3$) - LOS ANGELES SECOND SEASON

Estimated Population: 332,615
Sample Size Range: 22-23

	a/ Mid. Q.L.	Arith. Mean	b/ Arith. S.E.	c/ Geo. Mean	d/ Geo. S.E.	Percentiles							Range
						16	25	Med.	75	84	90	95	
Chloroform	0.21	0.35	0.12	0.10	0.03	0.02	0.03	0.03	0.60	0.77	1.08	1.80	0.02 - 2.40
1,2-Dichloroethane	0.19	0.05	0.01	0.04	0.01	0.02	0.02	0.03	0.07	0.12	0.12	0.14	0.02 - 0.14
1,1,1-Trichloroethane	e/	5.63	1.03	4.62	0.69	2.30	3.30	4.60	6.60	7.10	8.20	16.0	1.50 - 20.0
Benzene	e/	3.07	0.45	2.64	0.35	1.35	1.70	2.50	4.40	4.60	5.80	6.70	1.20 - 8.50
Carbon Tetrachloride	e/	0.66	0.05	0.63	0.04	0.50	0.53	0.64	0.72	0.78	0.96	1.10	0.33 - 1.10
Trichloroethylene	0.19	0.14	0.07	0.06	0.01	0.02	0.02	0.03	0.12	0.13	0.13	0.28	0.02 - 2.40
Tetrachloroethylene	e/	1.86	0.28	1.41	0.23	0.52	0.79	1.31	3.00	3.40	4.10	4.80	0.25 - 4.80
Styrene	0.18	0.75	0.16	0.50	0.11	0.12	0.24	0.57	0.82	1.30	1.30	2.30	0.07 - 3.10
m,p-Dichlorobenzene	0.24	0.77	0.15	0.52	0.11	0.15	0.28	0.50	1.29	1.48	1.65	2.05	0.05 - 2.35
o-Dichlorobenzene	0.19	0.12	0.05	0.05	0.01	0.02	0.02	0.03	0.07	0.27	0.27	0.82	0.02 - 0.82
Ethylbenzene	e/	2.65	0.58	2.04	0.29	1.35	1.40	1.80	3.00	3.90	5.00	5.90	0.63 - 13.0
o-Xylene	e/	2.51	0.33	2.10	0.29	1.14	1.40	1.90	3.90	4.60	4.80	5.40	0.59 - 6.30
m,p-Xylene	e/	7.98	1.07	6.71	0.88	3.10	4.60	7.30	11.0	13.0	15.0	18.0	2.10 - 26.0
n-Decane	0.76	0.66	0.12	0.48	0.09	0.11	0.46	0.48	0.82	1.10	1.30	2.00	0.10 - 2.00
n-Dodecane	0.95	0.51	0.11	0.35	0.07	0.12	0.13	0.53	0.62	0.74	1.00	1.10	0.12 - 3.10
1,4-Dioxane	0.19	0.19	0.09	0.05	0.02	0.02	0.02	0.02	0.03	0.32	0.76	0.76	0.02 - 2.40
n-Octane	0.42	0.74	0.13	0.50	0.14	0.08	0.26	0.71	1.20	1.20	1.40	1.50	0.07 - 1.60
n-Undecane	0.74	1.15	0.29	0.74	0.13	0.44	0.46	0.51	1.30	2.10	2.10	5.90	0.10 - 5.90
a-Pinene	0.39	0.48	0.13	0.29	0.06	0.06	0.23	0.26	0.56	0.70	1.10	2.20	0.05 - 2.20

a/ Mid. Q.L. = Median Quantifiable Limit
b/ Arith. S.E. = Standard Error of Arithmetic Mean
c/ Geo. Mean = Geometric Mean
d/ Geo. S.E. = Standard Error of Geometric Mean
e/ 100% measurable
* Arithmetic Mean or Geometric Mean significantly different between seasons at .05 level.

TABLE 184. WEIGHTED SUMMARY STATISTICS FOR SELECTED COMPOUNDS FOR DAYTIME OUTDOOR AIR ($\mu g/m^3$) - LOS ANGELES FIRST SEASON

Estimated Population: 332,615
Sample Size Range: 22-24

	a/ Mid. Q.L.	Arith. Mean	b/ Arith. S.E.	c/ Geo. Mean	d/ Geo. S.E.	Percentiles 16	25	Med.	75	84	90	95	Range
Chloroform	0.20	0.33	0.05	0.26*	0.04	0.14	0.14	0.28	0.39	0.51	0.59	1.00	0.02 - 1.50
1,2-Dichloroethane	0.20	0.11*	0.01	0.08*	0.01	0.03	0.03	0.13	0.14	0.17	0.22	0.26	0.02 - 0.37
1,1,1-Trichloroethane	e/	21.4 *	3.25	15.2 *	2.87	5.90	7.05	20.0	35.0	43.0	46.0	46.5	2.60 - 78.0
Benzene	e/	13.3 *	1.52	10.9 *	1.89	5.60	6.70	14.0	18.0	21.0	22.0	22.0	1.90 - 35.0
Carbon Tetrachloride	e/	0.55	0.02	0.53	0.03	0.46	0.50	0.56	0.63	0.67	0.69	0.69	0.20 - 1.30
Trichloroethylene	0.19	0.56*	0.09	0.42*	0.07	0.19	0.26	0.46	0.66	0.77	1.40	1.50	0.12 - 2.90
Tetrachloroethylene	e/	8.92*	1.41	6.13*	1.26	2.20	3.10	9.00	12.0	17.0	20.0	20.0	1.30 - 39.0
Styrene	0.20	3.45*	1.01	1.45	0.54	0.30	0.67	1.90	6.10	6.20	9.00	14.0	0.02 - 14.0
m,p-Dichlorobenzene	0.22	1.36	0.36	0.69	0.22	0.31	0.35	0.75	1.30	2.00	4.40	4.40	0.03 - 9.60
o-Dichlorobenzene	0.20	0.25*	0.06	0.18*	0.04	0.12	0.13	0.14	0.29	0.50	0.70	0.86	0.02 - 0.86
Ethylbenzene	e/	7.48*	1.08	5.74*	1.07	2.80	3.70	7.10	10.0	11.0	12.0	12.0	0.82 - 28.0
o-Xylene	e/	8.52*	1.30	6.51*	1.22	3.50	3.50	7.90	11.0	13.0	13.0	15.0	1.00 - 34.0
m,p-Xylene	e/	20.0 *	2.44	16.4 *	2.75	10.0	11.0	21.0	27.5	31.0	31.0	32.0	2.80 - 61.0
n-Decane	0.19	1.67*	0.30	1.11*	0.26	0.29	0.75	1.10	2.60	3.00	3.10	5.10	0.12 - 5.90
n-Dodecane	0.20	0.49	0.09	0.37	0.06	0.14	0.21	0.34	0.73	0.83	0.85	1.30	0.12 - 1.70
1,4-Dioxane	0.20	0.19	0.06	0.10*	0.02	0.03	0.03	0.13	0.14	0.33	0.37	0.87	0.02 - 1.60
n-Octane	0.22	2.88*	0.65	1.53*	0.40	0.48	0.82	1.90	4.20	5.50	5.65	6.30	0.03 - 18.0
n-Undecane	0.20	1.28*	0.24	0.86	0.21	0.28	0.59	1.06	1.70	2.60	2.80	3.00	0.02 - 4.40
a-Pinene	0.20	0.26	0.03	0.21	0.02	0.12	0.13	0.25	0.29	0.43	0.58	0.74	0.03 - 1.10

a/ Mid. Q.L. = Median Quantifiable Limit
b/ Arith. S.E. = Standard Error of Arithmetic Mean
c/ Geo. Mean = Geometric Mean
d/ Geo. S.E. = Standard Error of Geometric Mean
e/ 100% measurable
* Arithmetic Mean or Geometric Mean significantly different between seasons at .05 level.

TABLE 185. WEIGHTED SUMMARY STATISTICS FOR SELECTED COMPOUNDS FOR DAYTIME OUTDOOR AIR ($\mu g/m^3$) - LOS ANGELES SECOND SEASON

Estimated Population: 332,615
Sample Size Range: 22-24

	a/ Mid. Q.L.	Arith. Mean	b/ Arith. S.E.	c/ Geo. Mean	d/ Geo. S.E.	Percentiles 16	25	Med.	75	84	90	95	Range
Chloroform	0.21	0.34	0.11	0.09	0.03	0.03	0.03	0.03	0.42	1.10	1.10	1.50	0.02 - 2.40
1,2-Dichloroethane	0.20	0.08	0.01	0.05	0.01	0.02	0.02	0.03	0.12	0.13	0.13	0.14	0.02 - 0.21
1,1,1-Trichloroethane	e/	6.18	1.45	4.74	0.69	2.80	2.90	5.30	5.85	6.60	10.0	10.0	1.70 - 49.0
Benzene	e/	4.17	0.82	3.20	0.53	1.50	2.05	3.10	4.80	4.80	8.70	12.0	1.10 - 15.0
Carbon Tetrachloride	e/	0.66*	0.03	0.65*	0.03	0.51	0.57	0.64	0.78	0.84	0.88	0.88	0.41 - 1.00
Trichloroethylene	0.19	0.07	0.02	0.05	0.01	0.02	0.02	0.03	0.12	0.13	0.13	0.13	0.02 - 0.39
Tetrachloroethylene	e/	2.11	0.34	1.57	0.27	0.69	0.78	1.70	3.40	3.90	4.20	5.85	0.31 - 5.85
Styrene	0.20	1.02	0.28	0.63	0.14	0.21	0.33	0.63	1.20	1.34	2.80	4.70	0.03 - 4.70
m,p-Dichlorobenzene	0.24	0.87	0.33	0.41	0.08	0.15	0.16	0.36	0.56	0.66	0.88	4.55	0.13 - 9.35
o-Dichlorobenzene	0.19	0.05	0.02	0.04	0.01	0.02	0.02	0.02	0.03	0.08	0.14	0.28	0.02 - 0.28
Ethylbenzene	e/	3.48	1.01	2.25	0.35	1.19	1.60	1.90	3.00	3.40	3.40	14.0	0.89 - 34.0
o-Xylene	e/	2.95	0.58	2.24	0.31	1.14	1.30	2.25	3.30	4.00	4.70	11.0	0.79 - 17.0
m,p-Xylene	e/	10.9	3.15	7.43	1.06	4.10	5.30	6.70	10.0	12.0	12.0	50.0	3.10 - 99.0
n-Decane	0.77	0.73	0.07	0.63	0.06	0.46	0.48	0.50	0.96	1.20	1.50	1.90	0.27 - 1.80
n-Dodecane	0.96	0.90	0.34	0.45	0.08	0.12	0.24	0.51	0.63	0.96	1.40	2.60	0.12 - 13.0
1,4-Dioxane	0.20	0.13	0.06	0.04	0.01	0.02	0.02	0.03	0.03	0.13	0.47	0.65	0.02 - 1.80
n-Octane	0.43	0.74	0.14	0.55	0.09	0.23	0.36	0.50	1.20	1.20	1.60	2.00	0.21 - 3.50
n-Undecane	0.78	0.78	0.12	0.54	0.09	0.28	0.46	0.51	0.93	1.30	1.70	2.30	0.10 - 3.60
a-Pinene	0.39	0.51*	0.08	0.32*	0.06	0.21	0.24	0.29	0.63	0.83	1.30	1.30	0.05 - 2.30

a/ Mid. Q.L. = Median Quantifiable Limit
b/ Arith. S.E. = Standard Error of Arithmetic Mean
c/ Geo. Mean = Geometric Mean
d/ Geo. S.E. = Standard Error of Geometric Mean
e/ 100% measurable
* Arithmetic Mean or Geometric Mean significantly different between seasons at .05 level.

TABLE 186. WEIGHTED SUMMARY STATISTICS FOR SELECTED COMPOUNDS FOR WATER (ng/mL) - LOS ANGELES FIRST SEASON

Estimated Population: 332,615
Sample Size Range: 52

	a/ Mid. Q.L.	Arith. Mean	b/ Arith. S.E.	c/ Geo. Mean	d/ Geo. S.E.	Percentiles							Range
						16	25	Med.	75	84	90	95	
Chloroform	1.50	15.2	1.74	8.21	2.22	1.00	3.48	14.8	20.0	25.4	27.3	36.5	0.08 - 59.6
1,1,1-Trichloroethane	0.08	0.17	0.06	0.09*	0.01	0.05	0.05	0.08	0.14	0.18	0.21	0.44	0.03 - 4.18
Trichloroethylene	0.07	0.07	0.01	0.05	0.01	0.03	0.03	0.04	0.04	0.12	0.19	0.19	0.03 - 0.24
Bromodichloromethane	0.30	10.6	1.27	5.86	1.65	0.68	2.49	12.8	15.6	16.1	16.5	17.3	0.19 - 21.4
Dibromochloromethane	0.25	9.31	1.48	4.70	1.50	0.49	1.68	10.6	15.6	16.5	17.4	18.4	0.16 - 19.3
Tetrachloroethylene	0.05	0.06*	0.01	0.05*	0.01	0.03	0.03	0.03	0.09	0.09	0.11	0.16	0.03 - 0.21
Bromoform	0.55	0.61	0.07	0.52	0.06	0.34	0.34	0.53	0.85	0.97	1.10	1.18	0.15 - 1.64

a/ Mid. Q.L. = Median Quantifiable Limit
b/ Arith. S.E. = Standard Error of Arithmetic Mean
c/ Geo. Mean = Geometric Mean
d/ Geo. S.E. = Standard Error of Geometric Mean
* Arithmetic Mean or Geometric Mean significantly different between seasons at .05 level.

TABLE 187. WEIGHTED SUMMARY STATISTICS FOR SELECTED COMPOUNDS FOR WATER (ng/mL) - LOS ANGELES SECOND SEASON

Estimated Population: 332,615
Sample Size Range: 52

	a/ Mid. Q.L.	Arith. Mean	b/ Arith. S.E.	c/ Geo. Mean	d/ Geo. S.E.	Percentiles							Range
						16	25	Med.	75	84	90	95	
Chloroform	1.50	28.8 *	3.36	18.0 *	3.93	8.72	9.23	33.0	42.2	45.0	46.6	49.2	0.94 - 52.0
1,1,1-Trichloroethane	0.05	0.08	0.02	0.04	0.01	0.03	0.03	0.03	0.03	0.03	0.29	0.35	0.03 - 0.90
Trichloroethylene	0.05	0.07	0.02	0.04	0.01	0.03	0.03	0.03	0.03	0.03	0.26	0.42	0.03 - 0.56
Bromodichloromethane	0.30	20.4 *	2.34	11.4 *	2.83	6.43	7.66	24.3	31.0	32.6	32.8	37.0	0.19 - 38.5
Dibromochloromethane	0.30	27.6 *	3.10	13.7 *	3.82	8.10	15.4	31.6	42.1	44.2	47.8	49.8	0.19 - 55.0
Tetrachloroethylene	0.05	0.04	0.00	0.04	0.00	0.03	0.03	0.03	0.03	0.04	0.09	0.10	0.03 - 0.11
Bromoform	0.30	8.08*	2.37	2.86*	0.66	0.49	2.04	2.97	5.94	7.35	13.4	53.4	0.19 - 78.4

a/ Mid. Q.L. = Median Quantifiable Limit
b/ Arith. S.E. = Standard Error of Arithmetic Mean
c/ Geo. Mean = Geometric Mean
d/ Geo. S.E. = Standard Error of Geometric Mean
* Arithmetic Mean or Geometric Mean significantly different between seasons at .05 level.

means significantly higher and all but one of the medians higher. However, only the arithmetic means for 1,1,1-trichloroethane, benzene, tetrachloroethylene, styrene, and o-xylene were significantly higher in the first season. One explanation for this is that while the concentration levels appeared, generally, higher for first season in overnight personal air samples, the second season tended to have higher maximum values. As with overnight personal air, the concentration levels for daytime personal air seemed generally high in the first season with all but one of the medians higher and all but four of the geometric means significantly higher in the first season. The arithmetic means for chloroform, 1,2-dichloroethane, benzene, styrene, c-dichlorobenzene, ethylbenzene, and o-xylene were significantly higher in the first season.

For overnight outdoor air, the trend of higher concentration levels in the first season appeared even stronger with only the geometric mean for carbon tetrachloride, and the arithmetic means for carbon tetrachloride, o-dichlorobenzene, n-dodecane, and n-undecane not significantly higher in the first season. As with the other air samples, the concentration levels for first season daytime outdoor air appeared generally higher with the means significantly higher. Three exceptions were carbon tetrachloride, n-dodecane, and a-pinene. For carbon tetrachloride and a-pinene both the arithmetic and geometric means were significantly higher in the second season (spring).

For water, the arithmetic and geometric means for chloroform, bromodichloromethane, dibromochloromethane, and bromoform were significantly higher in the second season, while the geometric means for 1,1,1-trichloroethane and tetrachloroethylene were significantly higher in the first season.

The medians for the two seasons are compared in Table 188 by showing the ratio of first season to second season. Generally, the medians for personal and outdoor airs appeared higher in the first season with 1,2-dichloroethane for overnight personal air; chloroform, trichloroethylene, and 1,4-dioxane for overnight outdoor air; and chloroform and trichloroethylene for daytime outdoor air showing ratios of ten or higher. For breath, there appeared to be less difference

TABLE 188. RATIOS OF FIRST SEASON MEDIANS TO SECOND SEASON MEDIANS BY MEDIA - LOS ANGELES

Compound	Breath	Overnight Personal Air	Daytime Personal Air	Overnight Outdoor Air	Daytime Outdoor Air
Chloroform	0.94	1.94	3.38	20.9	10.0
1,2-Dichloroethane	1.00	10.2	9.63	8.63	4.81
1,1,1-Trichloroethane	1.47	3.33	2.18	6.74	3.77
Benzene	0.69	3.15	1.81	7.60	4.52
Carbon Tetrachloride	1.00	0.91	1.01	1.03	0.88
Trichloroethylene	1.00	3.24	1.75	23.8	17.0
Tetrachloroethylene	1.38	3.58	2.41	5.63	5.29
Styrene	1.00	3.58	1.60	7.37	3.02
m,p-Dichlorobenzene	0.77	2.15	1.86	3.39	2.11
o-Dichlorobenzene	1.00	4.66	1.08	8.24	5.61
Ethylbenzene	1.52	2.68	1.38	6.11	3.74
o-Xylene	1.76	3.41	2.43	5.79	3.51
m,p-Xylene	1.68	2.30	1.22	4.11	3.13
n-Decane	1.21	2.00	1.38	5.44	2.19
n-Dodecane	0.51	2.61	2.63	1.43	0.67
1,4-Dioxane	1.00	9.50	9.77	11.8	5.00
n-Octane	0.66	1.84	1.22	6.06	3.80
n-Undecane	1.21	2.18	2.08	4.35	2.08
a-Pinene	1.18	1.56	1.39	3.39	0.88

Compound	Water
Chloroform	0.45
1,1,1-Trichloroethane	2.44
Trichloroethylene	1.40
Bromodichloromethane	0.52
Dibromochloromethane	0.33
Tetrachloroethylene	1.00
Bromoform	0.18

between the medians with ratios ranging from 0.51 to 1.76. However, water showed more variability with ratios ranging from 0.18 to 2.44.

Generally, the concentration levels appeared higher in the first season (winter) for personal and outdoor airs and possibly slightly higher for breath. For water, there seemed to be some tendency toward higher concentrations in the second season (spring).

As examples of the levels observed in the two seasons, Figures 95 through 102 show box plots of selected compounds for breath, overnight personal air, overnight outdoor air, daytime personal air, and daytime outdoor air. Generally, first season values appeared higher than those for second season. The plots also indicate the skewness of many of the concentration distributions and show why it is difficult to draw conclusions when examining the arithmetic means.

CORRELATIONS

To further examine the possible relationships between seasons, unweighted Spearman correlations were calculated for all amounts and for measurable amounts only for individuals sampled in both seasons. Table 189 shows the correlations between the individuals sampled in the two seasons for breath and air for all amounts. Overall, there appears to be no strong correlations between the seasons. The highest correlations were for chloroform and trichloroethylene in overnight personal air, trichloroethylene in daytime personal air, a-pinene in overnight outdoor air and tetrachloroethylene in daytime outdoor air ranging between .60 and .70 in value.

Table 190 gives the correlations between breath and air for measurable amounts only. The correlation was not reported if the sample size was less than five. Although there may be a slight increase in the correlations overall, there still appeared to be no strong correlations between the seasons.

The Spearman correlations for water are shown in Table 191. Bromodichloromethane and dibromochloromethane showed the strongest correlations for all amounts and measurable amounts only with a .59 to .78 range.

Figures 103 through 140 further demonstrate this lack of strong correlation between the seasons with scatter plots of the natural logarithms of concentrations for selected compounds for first versus

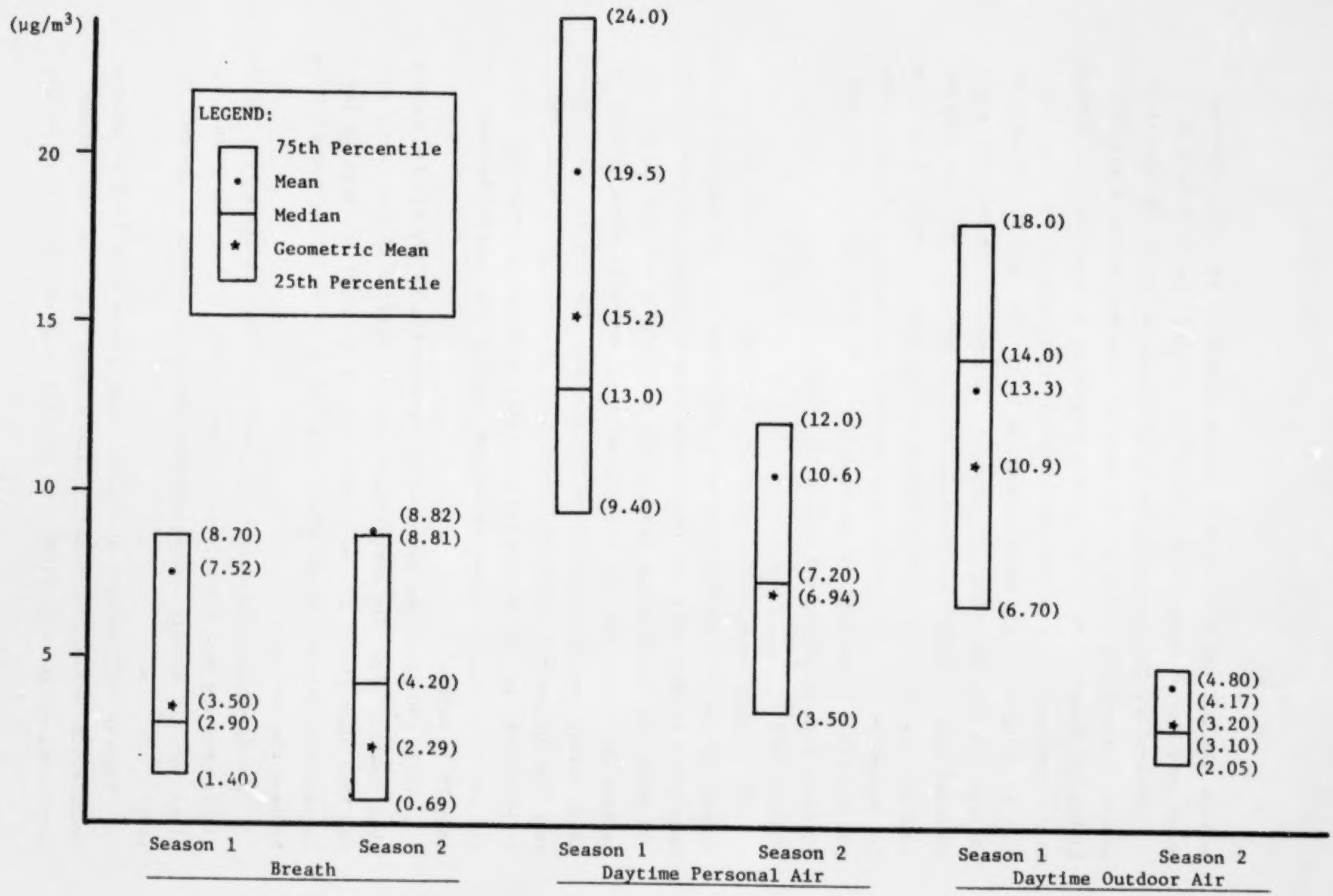

Figure 95. Box plots for weighted arithmetic means, geometric means, medians, 25th and 75th percentiles for benzene for breath, daytime personal air and daytime outdoor air by season - Los Angeles

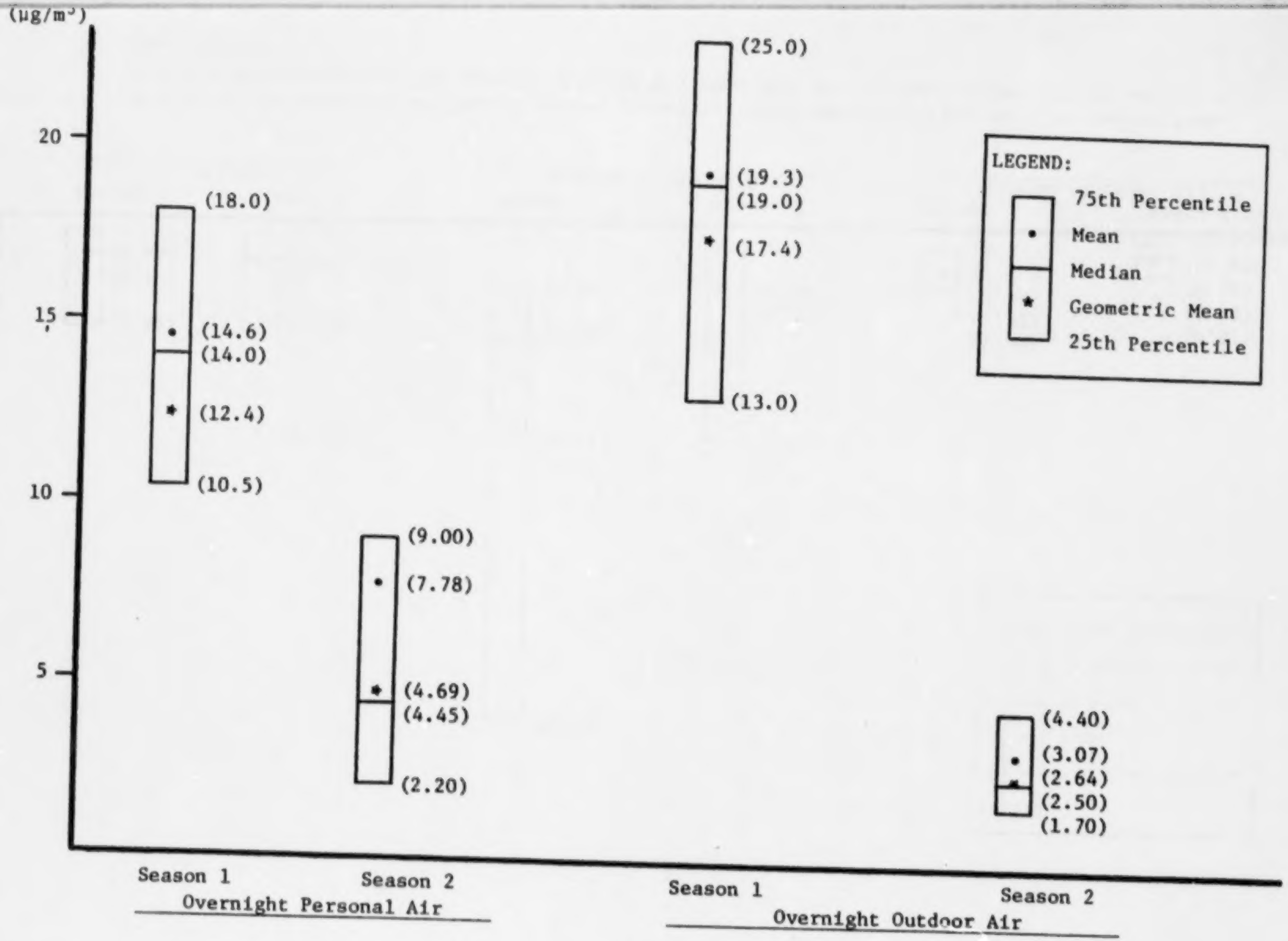

Figure 96. Box plots for weighted arithmetic means, geometric means, medians, 25th and 75th percentiles for benzene for overnight personal air and overnight outdoor air by season - Los Angeles

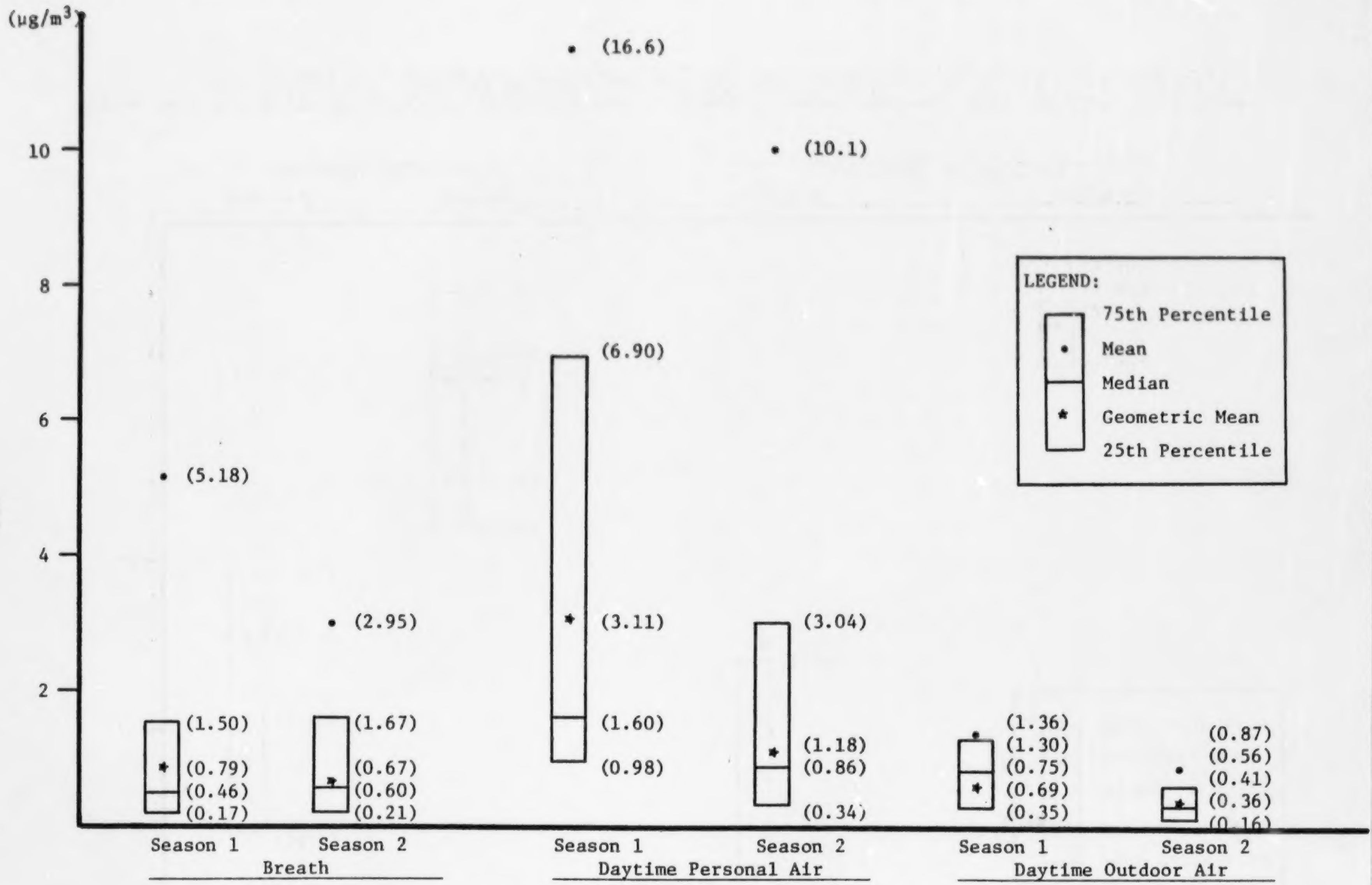

Figure 97. Box plots for weighted arithmetic means, geometric means, medians, 25th and 75th percentiles for m,p-dichlorobenzene for breath, daytime personal air and daytime outdoor air by season - Los Angeles.

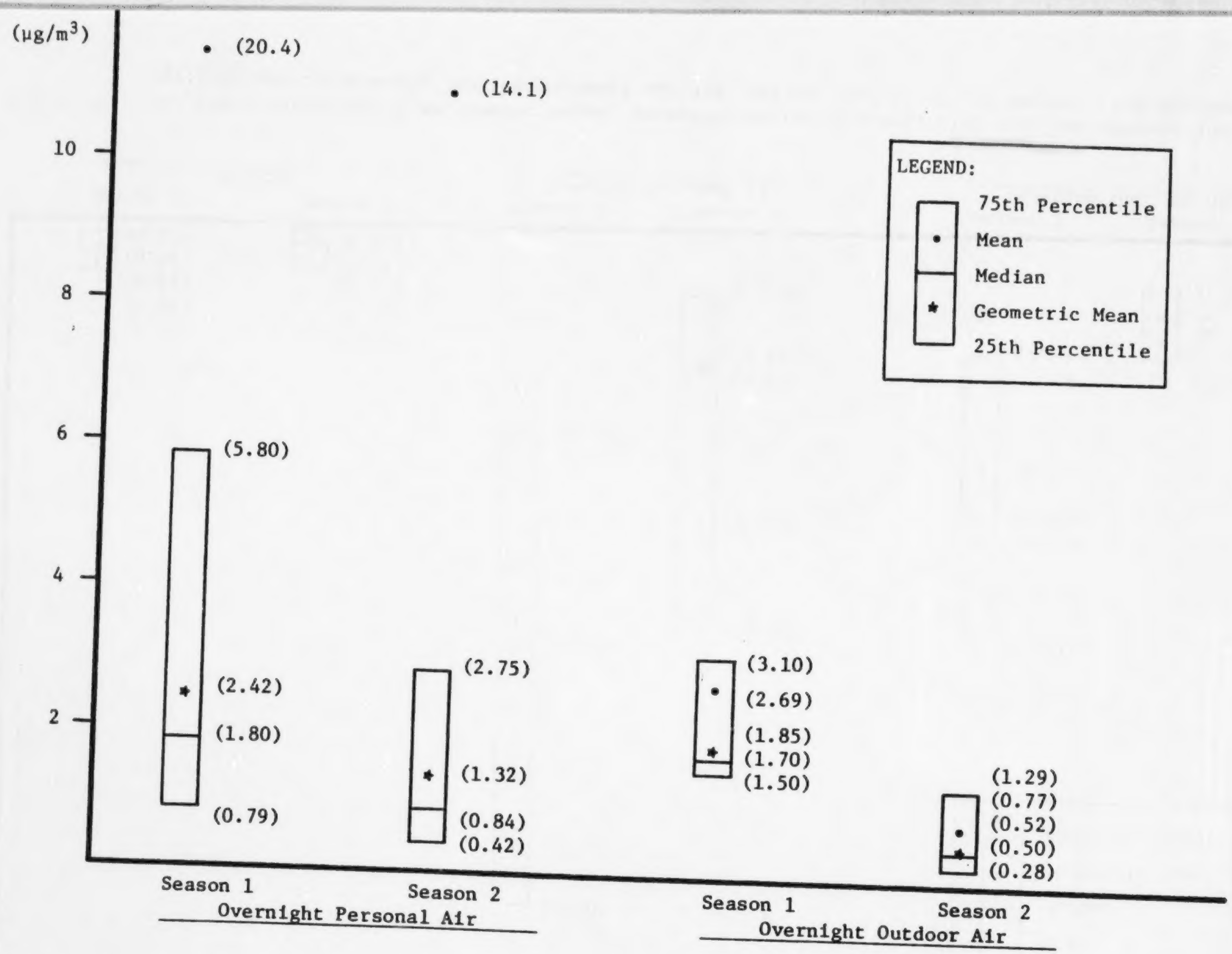

Figure 98. Box plots for weighted arithmetic means, geometric means, medians, 25th and 75th percentiles for m,p-dichlorobenzene for overnight personal air and overnight outdoor air by season - Los Angeles.

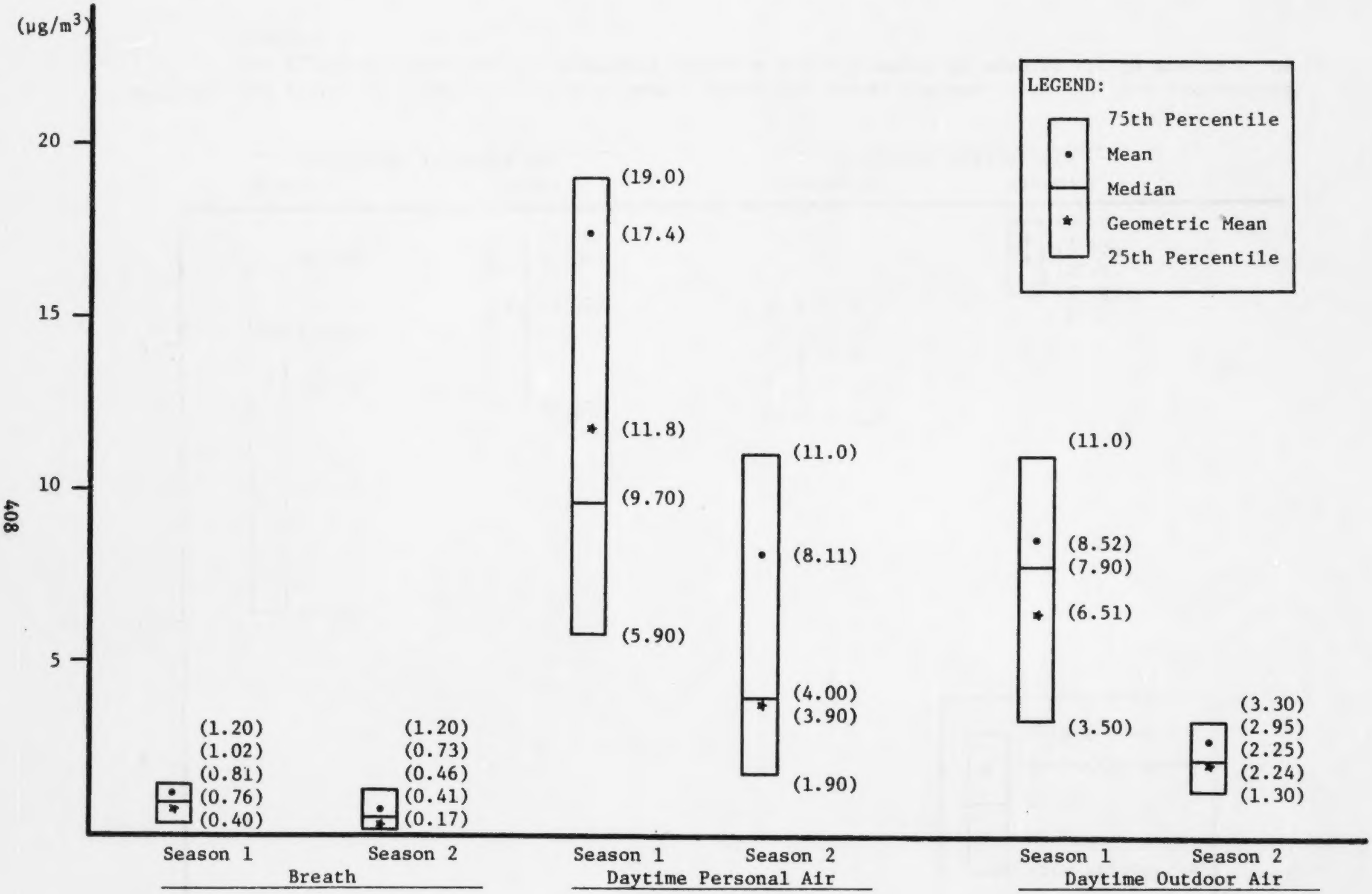

Figure 99. Box plots for weighted arithmetic means, geometric means, medians, 25th and 75th percentiles for o-xylene for breath, daytime personal air and daytime outdoor air by season - Los Angeles.

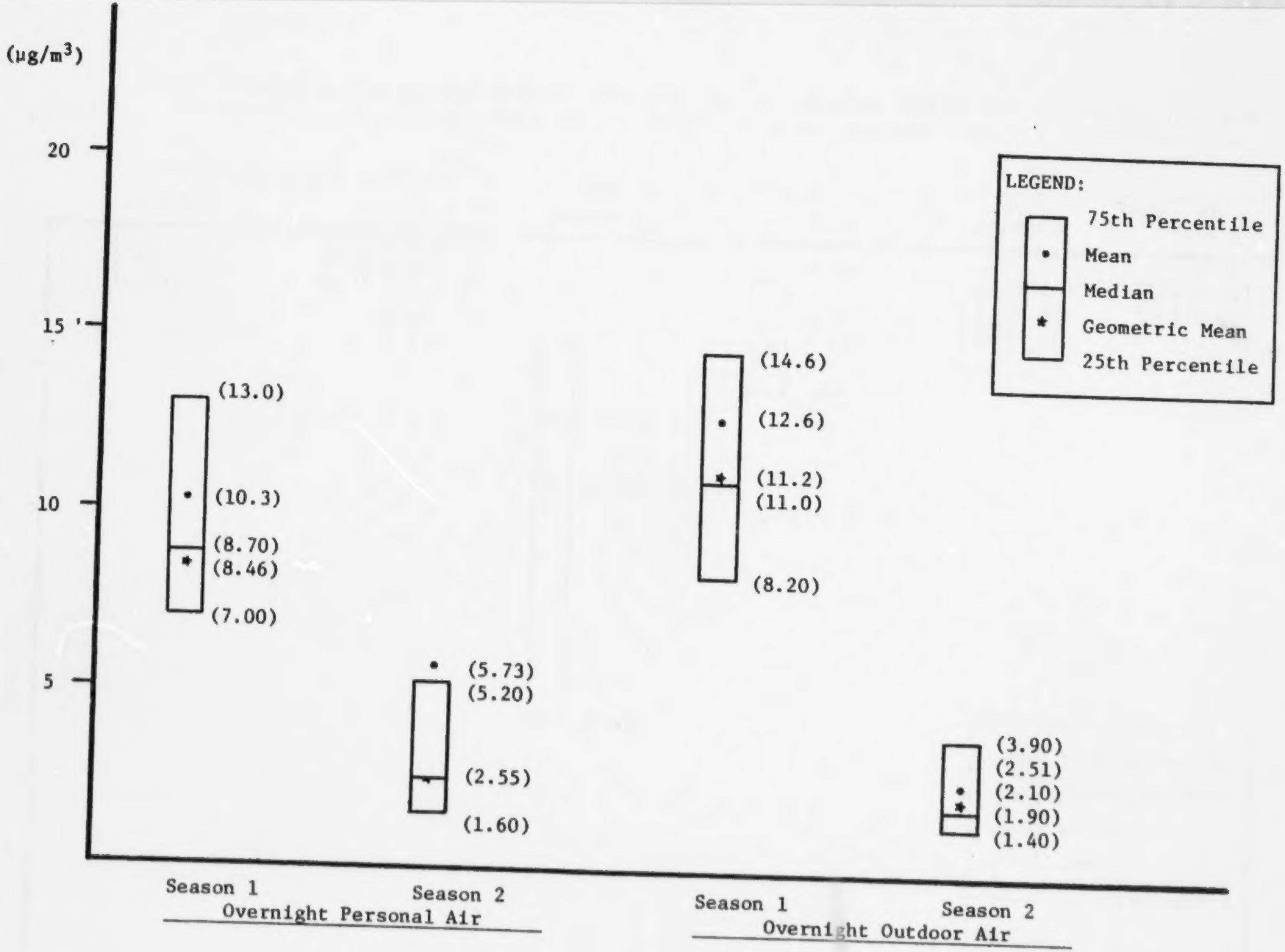

Figure 100. Box plots for weighted arithmetic means, geometric means, medians, 25th and 75th percentiles for o-xylene for overnight personal air and overnight outdoor air by season - Los Angeles.

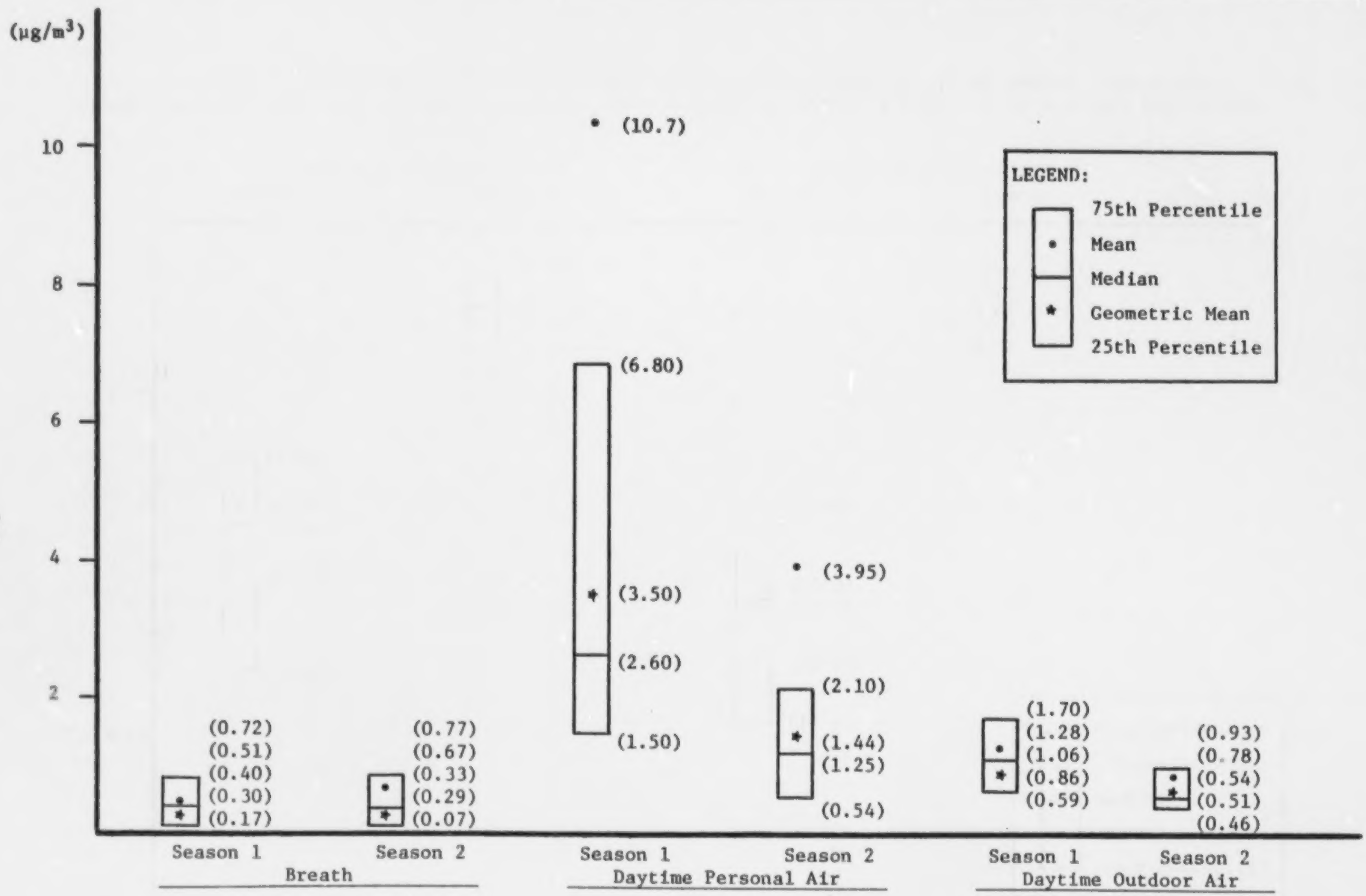

Figure 101. Box plots of weighted arithmetic means, geometric means, medians, 25th and 75th percentiles for n-undecane for breath, daytime personal air, and daytime outdoor air by season - Los Angeles.

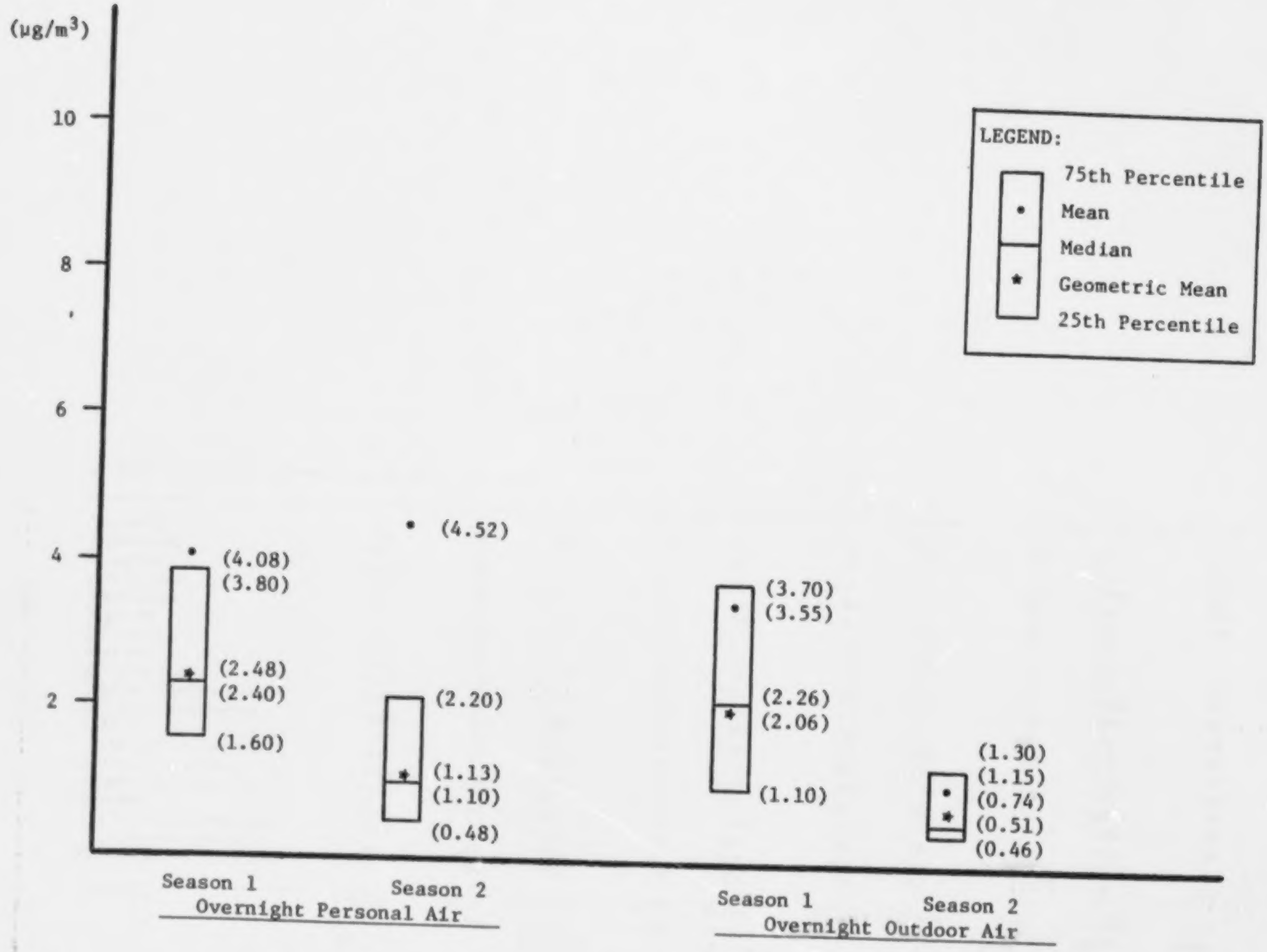

Figure 102. Box plots for weighted arithmetic means, geometric means, medians, 25th and 75th percentiles for n-undecane for overnight personal air and overnight outdoor air by season - Los Angeles.

TABLE 189. SPEARMAN CORRELATIONS BETWEEN INDIVIDUALS SAMPLED IN THE FIRST AND SECOND SEASON LOS ANGELES FOR ALL AMOUNTS OF SELECTED COMPOUNDS

	Breath		Overnight Personal Air		Daytime Personal Air		Overnight Outdoor Air		Daytime Outdoor Air	
Compound	Spearman Corre- lation	Sample Size	Spearman Corre- lation	Sample Size	Spearman Corre- lation	Sample Size	Spearman Corre- lation	Sample Size	Spearman Corre- lation	Sample Size
Chloroform	.17	49	.60*	51	.17	49	.05	22	-.09	23
1,2-Dichloroethane	.05	49	.43*	50	.22	49	.19	22	.07	22
1,1,1-Trichloroethane	.44*	51	.29*	51	.26	50	.18	23	.45*	24
Benzene	.57*	51	.08	51	.36*	50	.29	23	.51*	24
Carbon Tetrachloride	.27	49	.21	51	.26	50	.00	22	.06	24
Trichloroethylene	.49*	49	.66*	51	.70*	49	.43*	22	.26	23
Tetrachloroethylene	.42*	51	.49*	50	.21	50	.16	23	.67*	24
Styrene	.24	50	.13	50	.29*	50	.59*	23	.08	24
m,p-Dichlorobenzene	.42*	50	.56*	50	.48*	50	.34	22	.30	23
o-Dichlorobenzene	.10	50	.10	48	.19	47	.20	22	.11	22
Ethylbenzene	.53*	51	.37*	50	.27	50	.13	23	.58*	24
o-Xylene	.48*	51	.29*	50	.10	50	.14	23	.38	24
m,p-Xylene	.55*	51	.27	50	.27	50	.29	23	.42*	24
n-Decane	.13	51	.31*	48	.13	50	.16	22	.05	24
n-Dodecane	-.04	49	.35*	48	.33*	49	.13	22	.37	24
1,4-Dioxane	.03	49	.03	50	.10	49	.15	22	-.08	22
n-Octane	.47*	50	.21	50	.16	50	.03	22	.52*	24
n-Undecane	-.06	51	.27	49	.18	49	-.17	23	.15	24
a-Pinene	.37*	51	.54*	50	.47*	50	.63*	22	.20	22

* Significantly different from zero at .05 level.

TABLE 190. SPEARMAN CORRELATIONS BETWEEN INDIVIDUALS SAMPLED IN THE FIRST AND SECOND SEASON LOS ANGELES FOR MEASURABLE AMOUNTS ONLY OF SELECTED COMPOUNDS

	Breath		Overnight Personal Air		Daytime Personal Air		Overnight Outdoor Air		Daytime Outdoor Air	
Compound	Spearman Corre-lation	Sample Size	Spearman Corre-lation	Sample Size	Spearman Corre-lation	Sample Size	Spearman Corre-lation	Sample Size	Spearman Corre-lation	Sample Size
Chloroform	.40	9	.56*	40	-.02	30	.60	5	.70	7
1,2-Dichloroethane		0	-.50	5	.32	9		0		1
1,1,1-Trichloroethane	.46*	45	.30*	50	.26	50	.18	23	.45*	24
Benzene	.74*	39	.18	49	.36*	50	.29	23	.51*	24
Carbon Tetrachloride		1	.29*	48	.29*	48	.12	21	.06	24
Trichloroethylene	.43	16	.37*	30	.66*	30		3		2
Tetrachloroethylene	.42*	51	.49*	48	.22	49	.07	22	.67*	24
Styrene	-.21	14	.32	36	.29	41	.58*	20	.19	20
m,p-Dichlorobenzene	.59*	25	.58*	42	.49*	41	.33	17	-.03	16
o-Dichlorobenzene		0		3		0		3		0
Ethylbenzene	.65*	34	.37*	47	.26	48	.13	23	.58*	24
o-Xylene	.50*	34	.37*	48	.25	47	.14	23	.38	24
m,p-Xylene	.55*	51	.27	50	.27	50	.29	23	.42*	24
n-Decane	-.04	12	.34	25	-.02	38	.38	10	.67*	11
n-Dodecane	.21	5	.02	9	-.01	22	.64	7	.66	9
1,4-Dioxane		0	-.45	7	.80	5		3		1
n-Octane	.54*	29	.30*	45	.15	44	-.26	16	.52*	15
n-Undecane	-.04	17	.14	27	.05	35	-.01	11	.71*	11
a-Pinene	.21	36	.53*	41	.65*	36	.18	9	.45	7

* Significantly different from zero at .05 level.

TABLE 191. SPEARMAN CORRELATIONS BETWEEN FIRST AND SECOND SEASON LOS ANGELES WATER SAMPLES FOR ALL AMOUNTS AND MEASURABLE AMOUNTS ONLY FOR SELECTED COMPOUNDS

Compound	All Amounts		Measurable Amounts	
	Spearman Corre- lations	Sample Size	Spearman Corre- lations	Sample Size
Chloroform	.56*	52	.47*	45
1,1,1-Trichloroethane	.17	52	.54	6
Trichloroethylene	.04	52		0
Bromodichloromethane	.69*	52	.59*	47
Dibromochloromethane	.78*	52	.66*	44
Tetrachloroethylene	.08	52	-.90*	5
Bromoform	.45*	52	.23	33

* Significantly different from zero at .05 level.

second season. One was added to each number before the logarithm was taken so each plot starts at zero. The lines represent the median quantifiable limits for the compound for the two seasons. An "O" represents both concentrations measurable. An "X" represents one or both not measurable. The Spearman correlations are also shown. The figures not only demonstrate the large variability in the data but also indicate for some compounds and media the positive relationships between seasons. However, strong correlations between the two seasons are not evident.

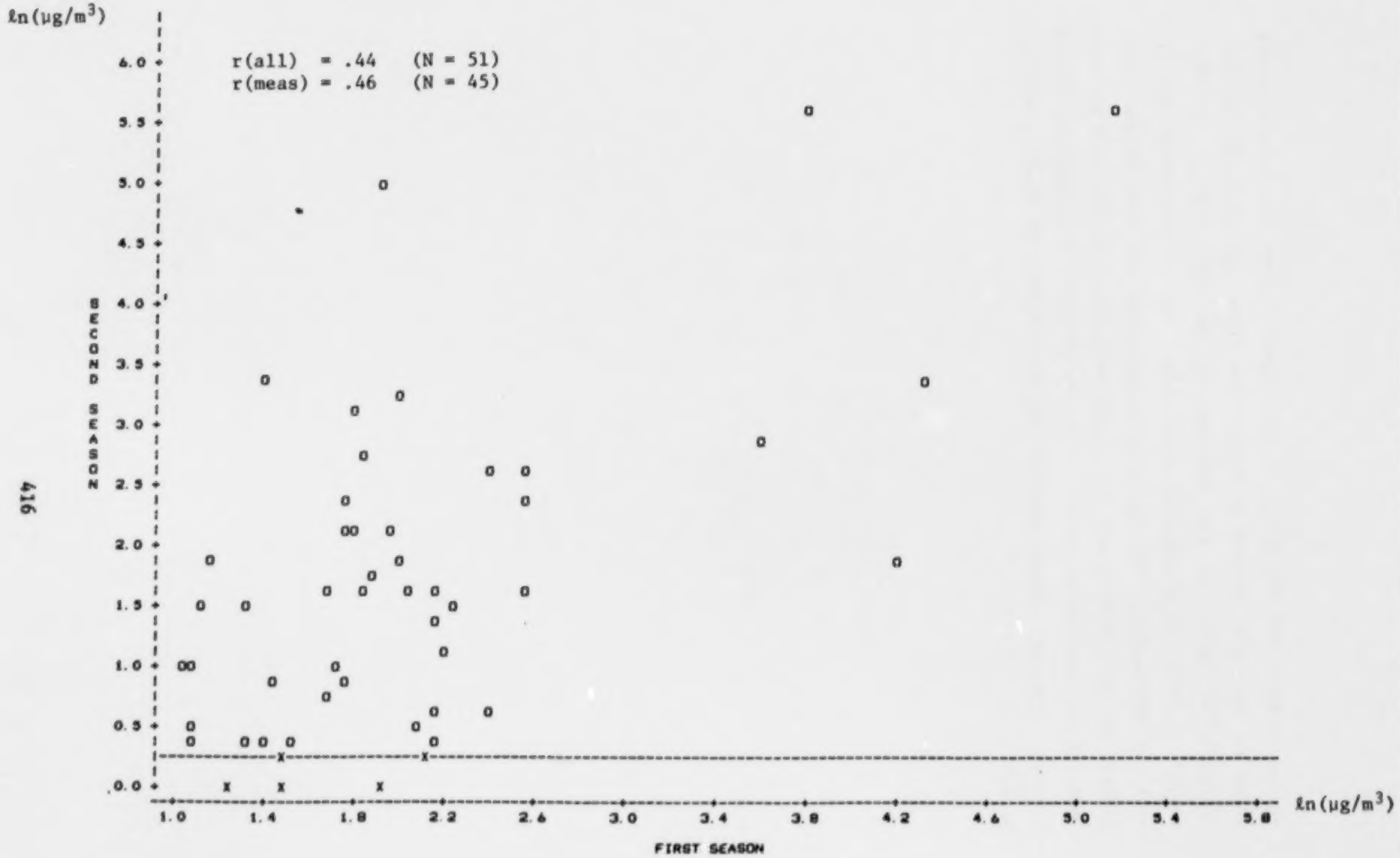

Figure 103. 1,1,1-Trichloroethane for breath - Los Angeles

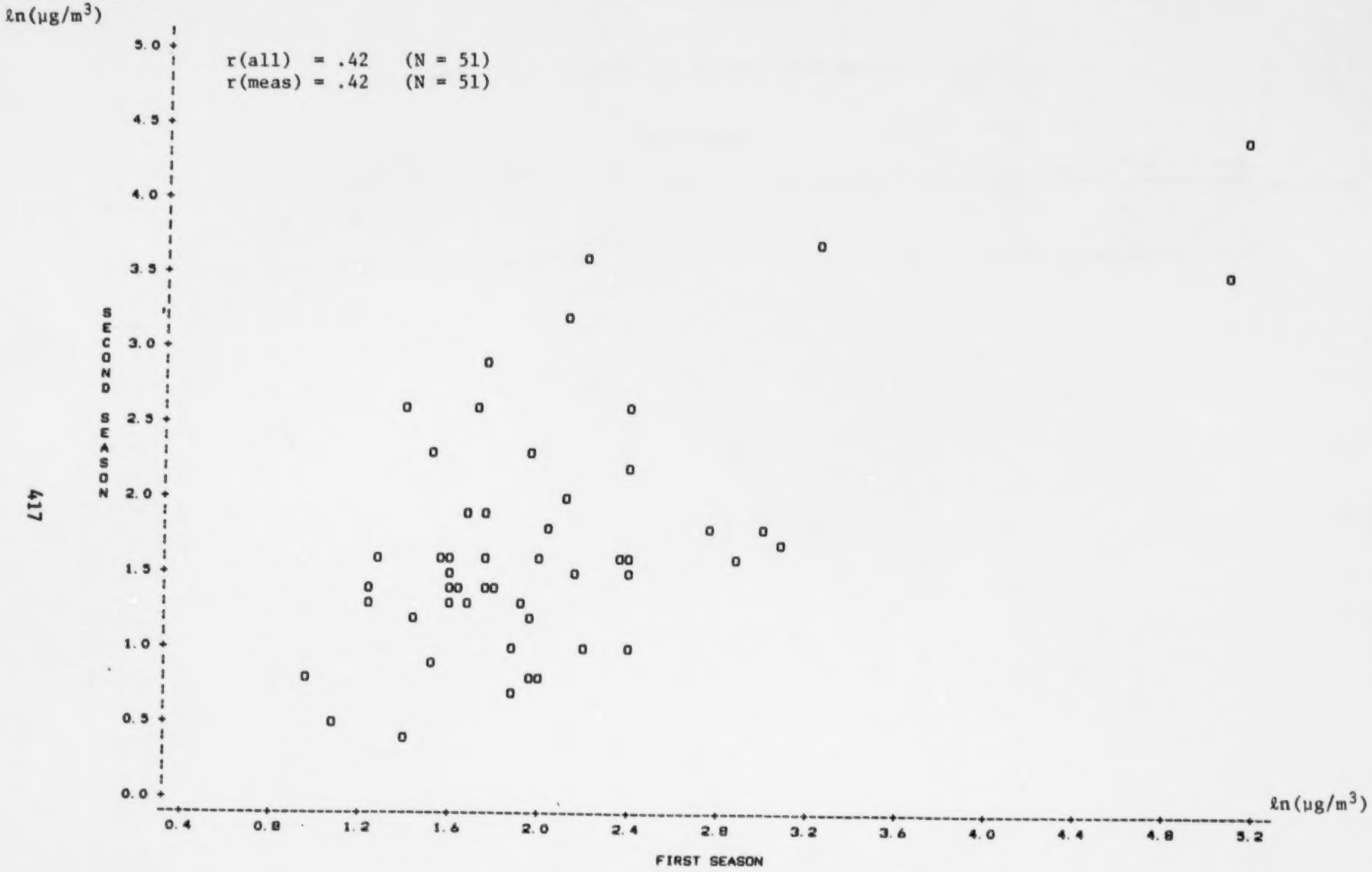

Figure 104. Tetrachloroethylene for breath - Los Angeles.

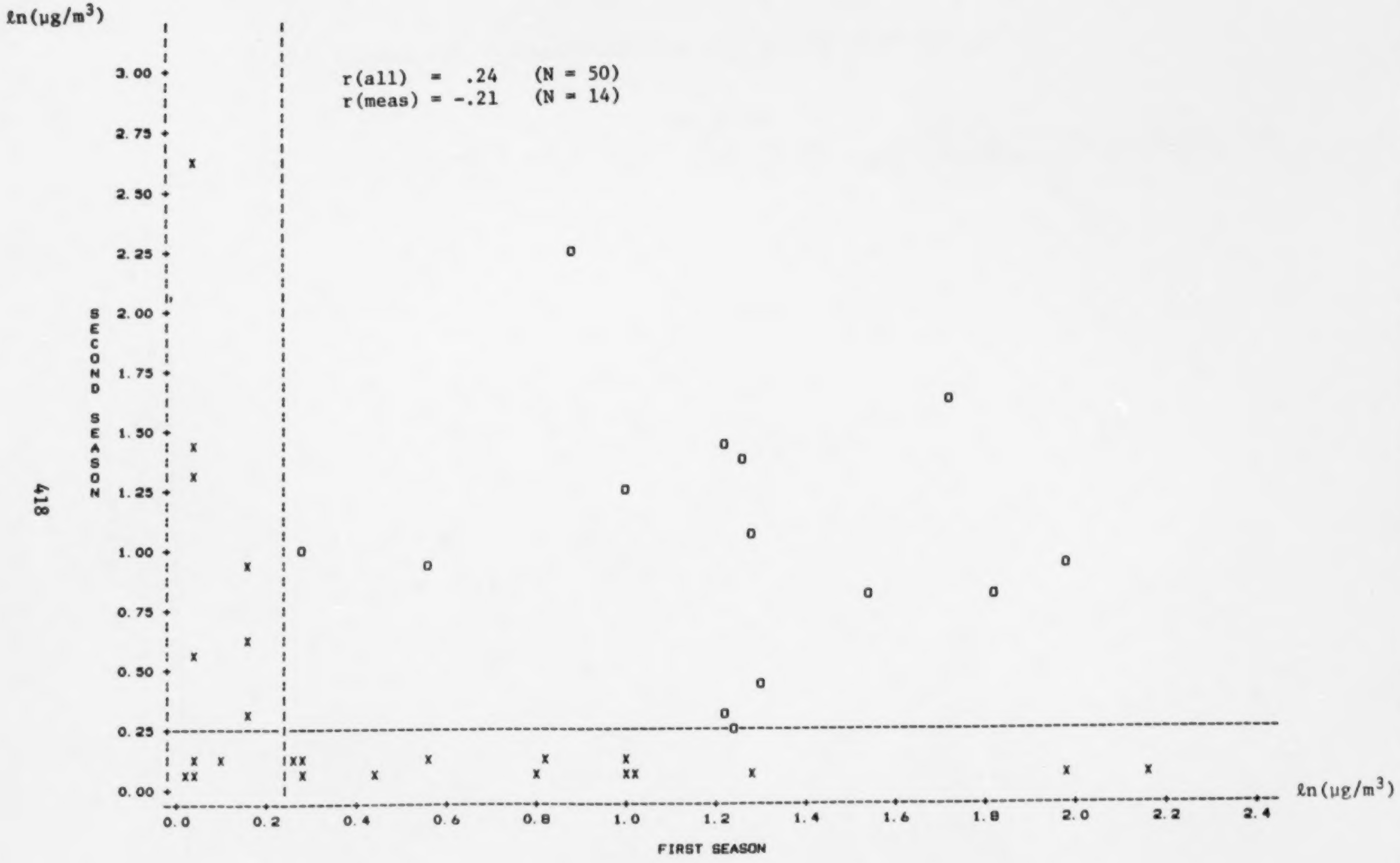

Figure 105. Styrene for breath - Los Angeles.

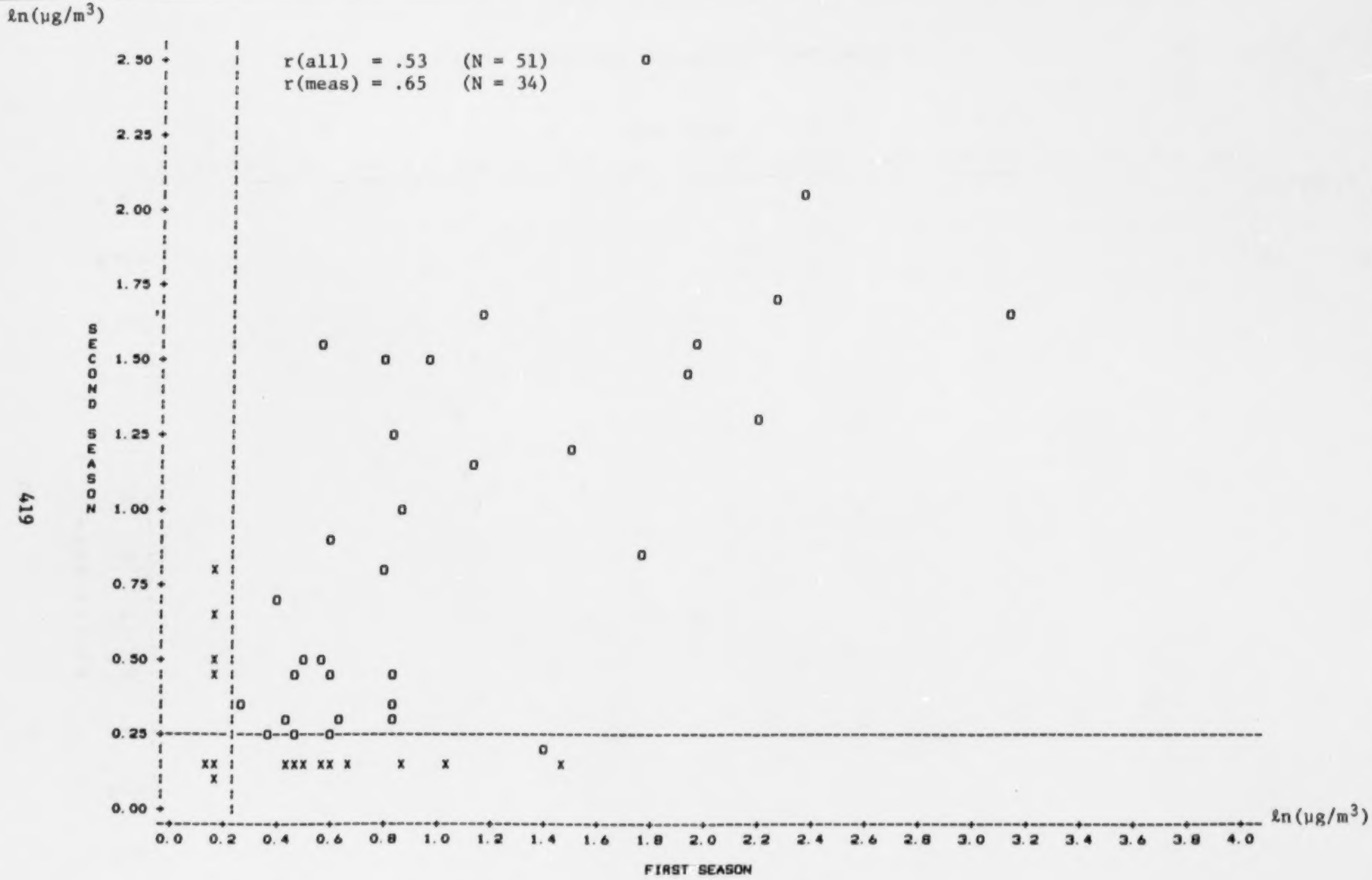

Figure 106. Ethylbenzene for breath - Los Angeles.

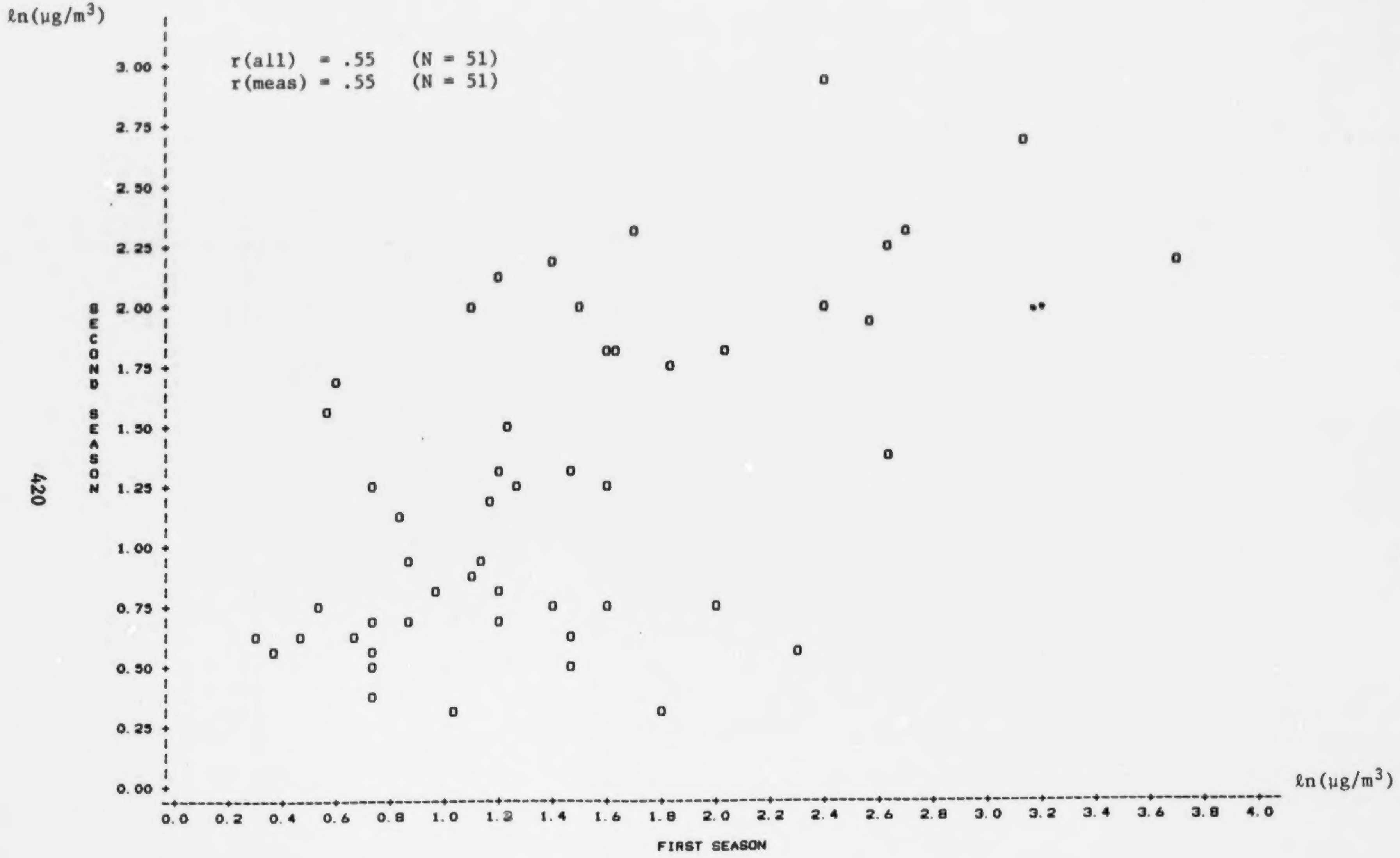

Figure 107. m,p-Xylene for breath - Los Angeles.

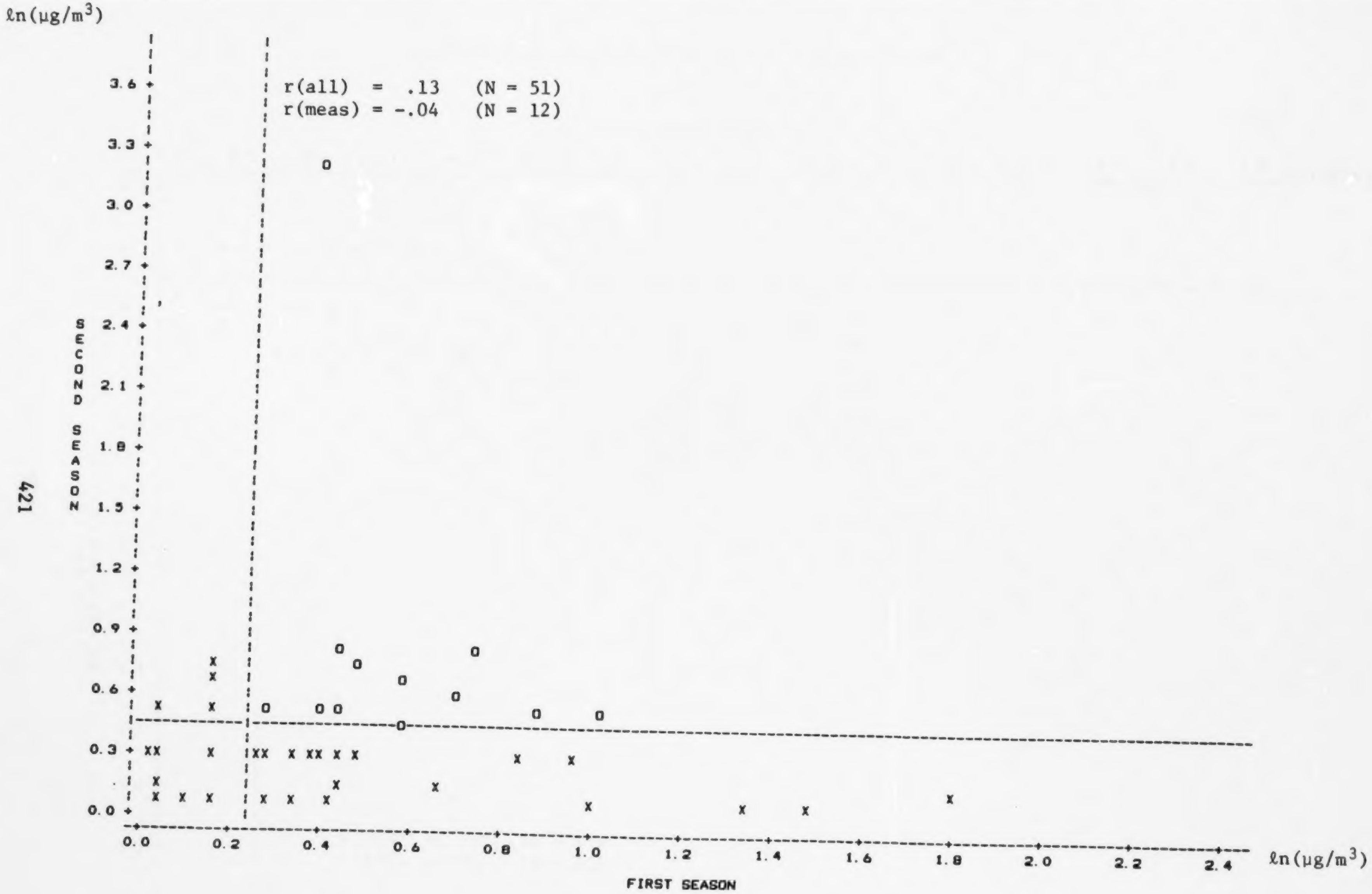

Figure 108. n-Decane for breath - Los Angeles.

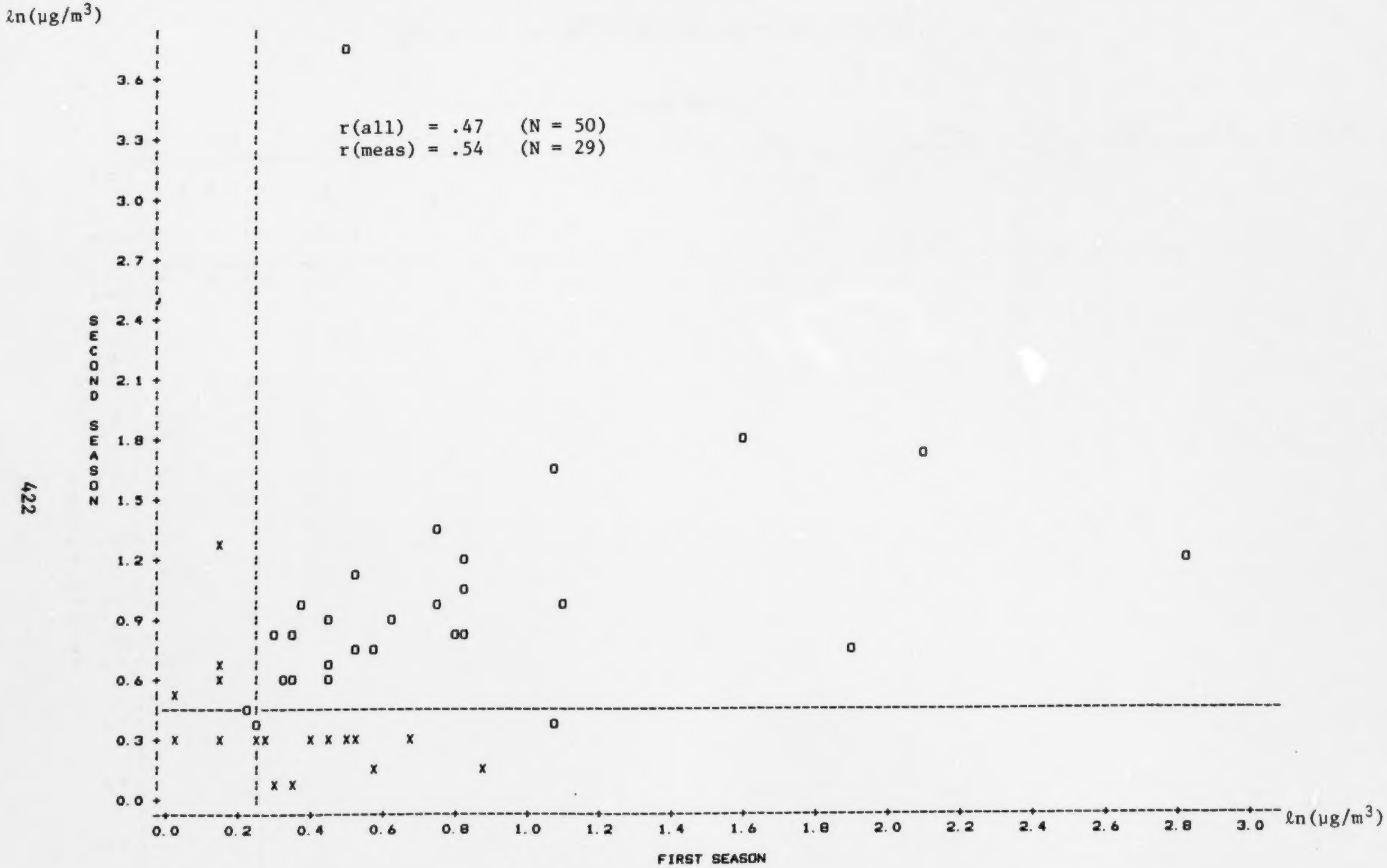

Figure 109. n-Octane for breath - Los Angeles.

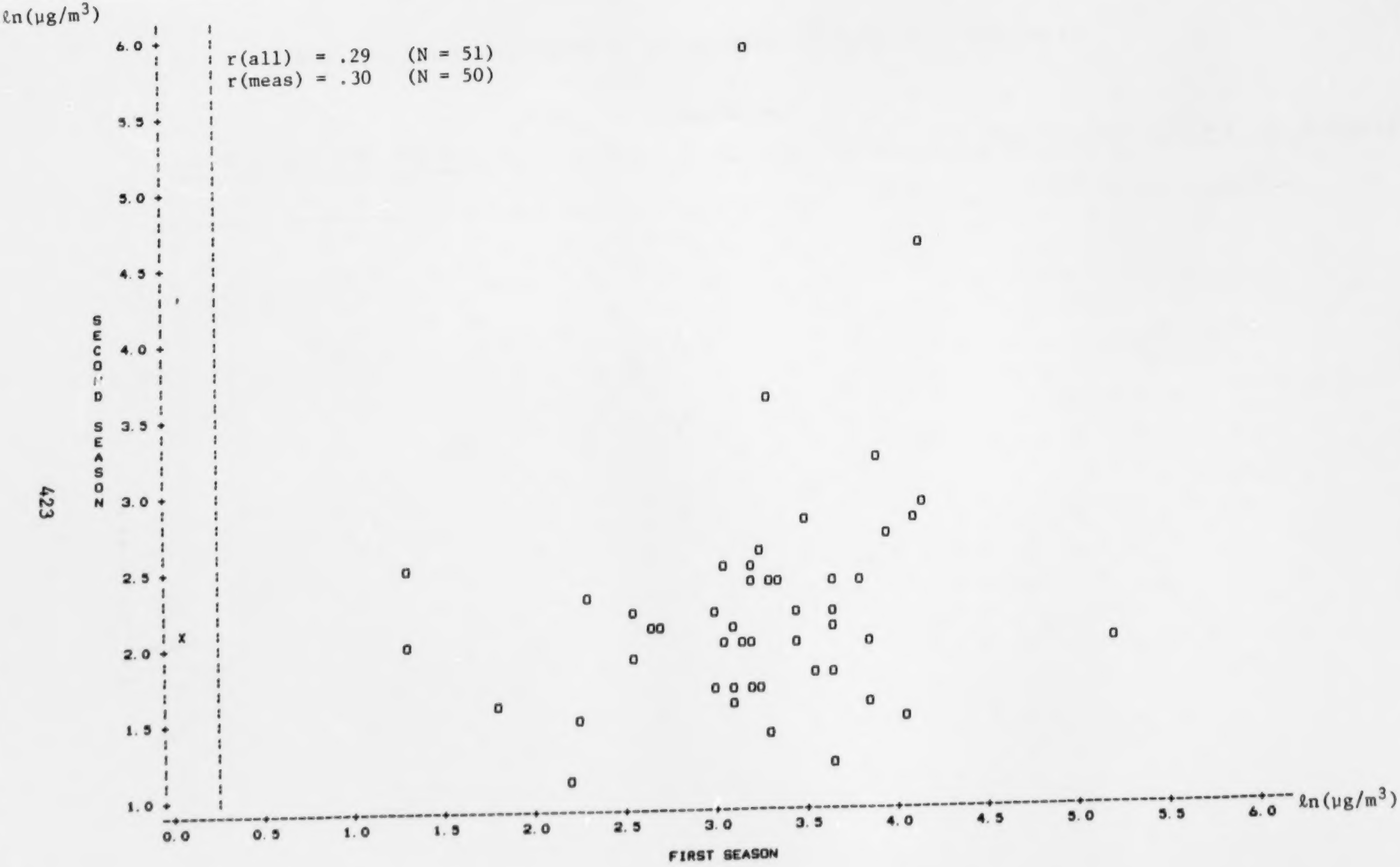

Figure 110. 1,1,1-Trichloroethane for overnight personal air - Los Angeles.

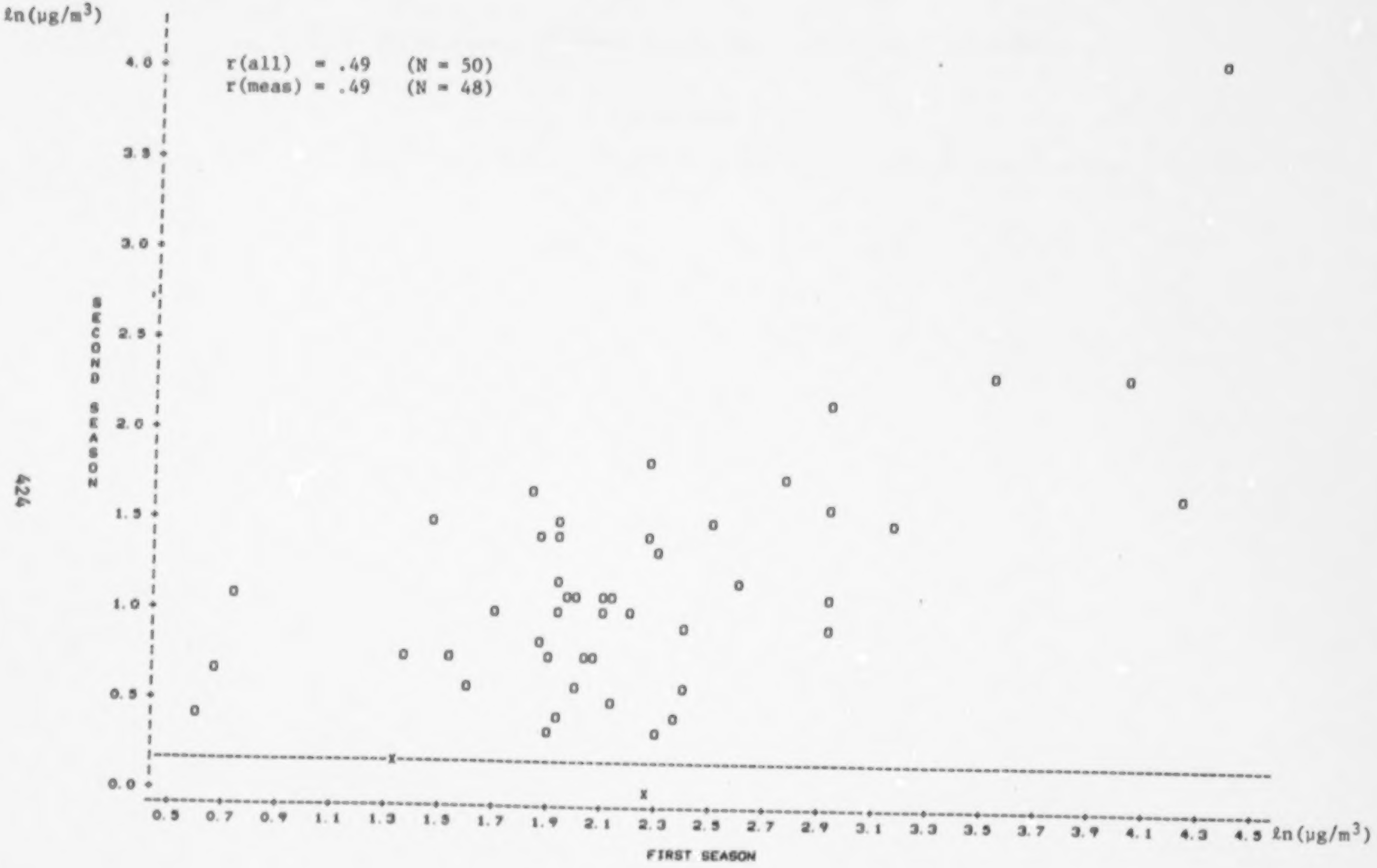

Figure 111. Tetrachloroethylene for overnight personal air - Los Angeles.

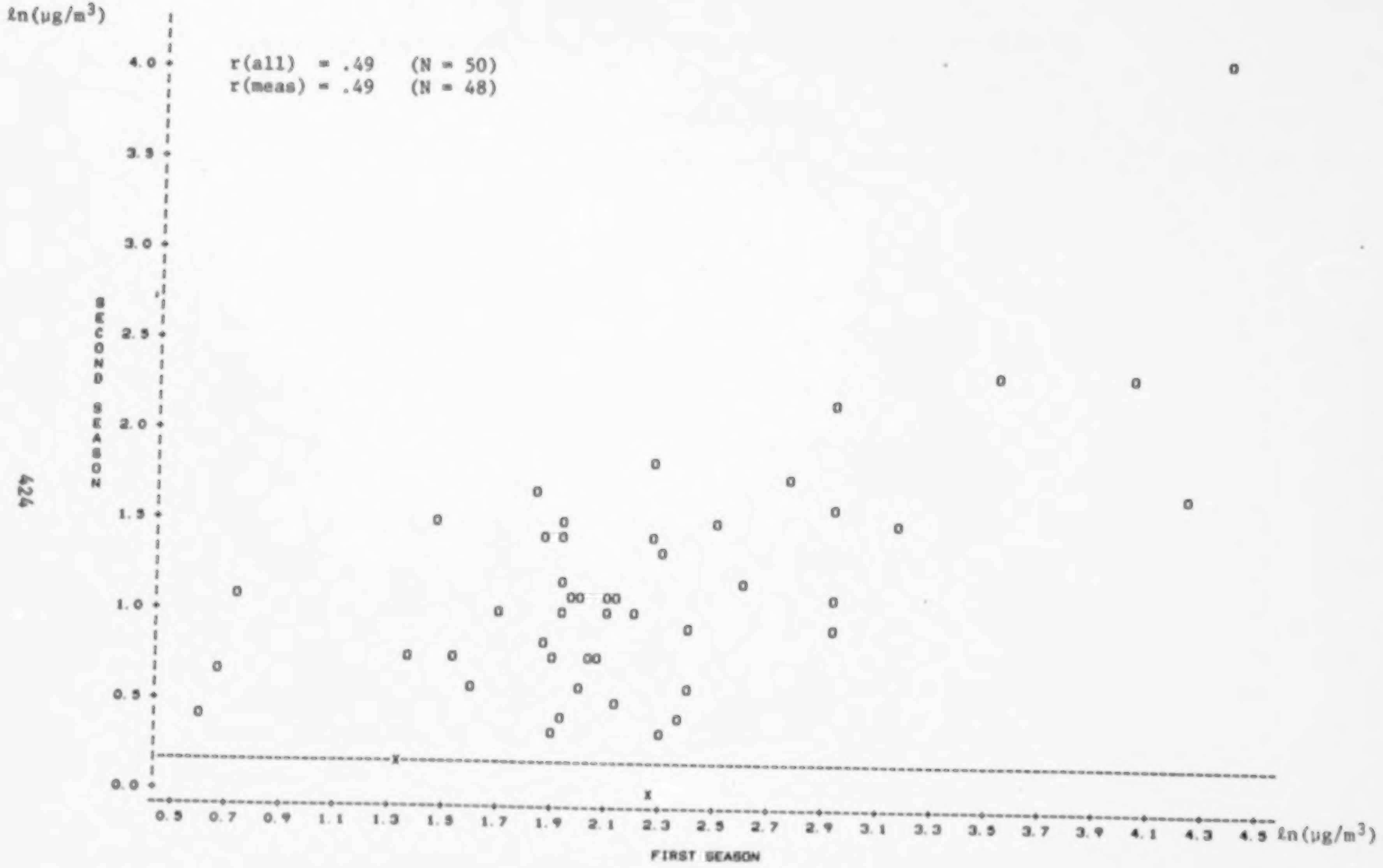

Figure 111. Tetrachloroethylene for overnight personal air - Los Angeles.

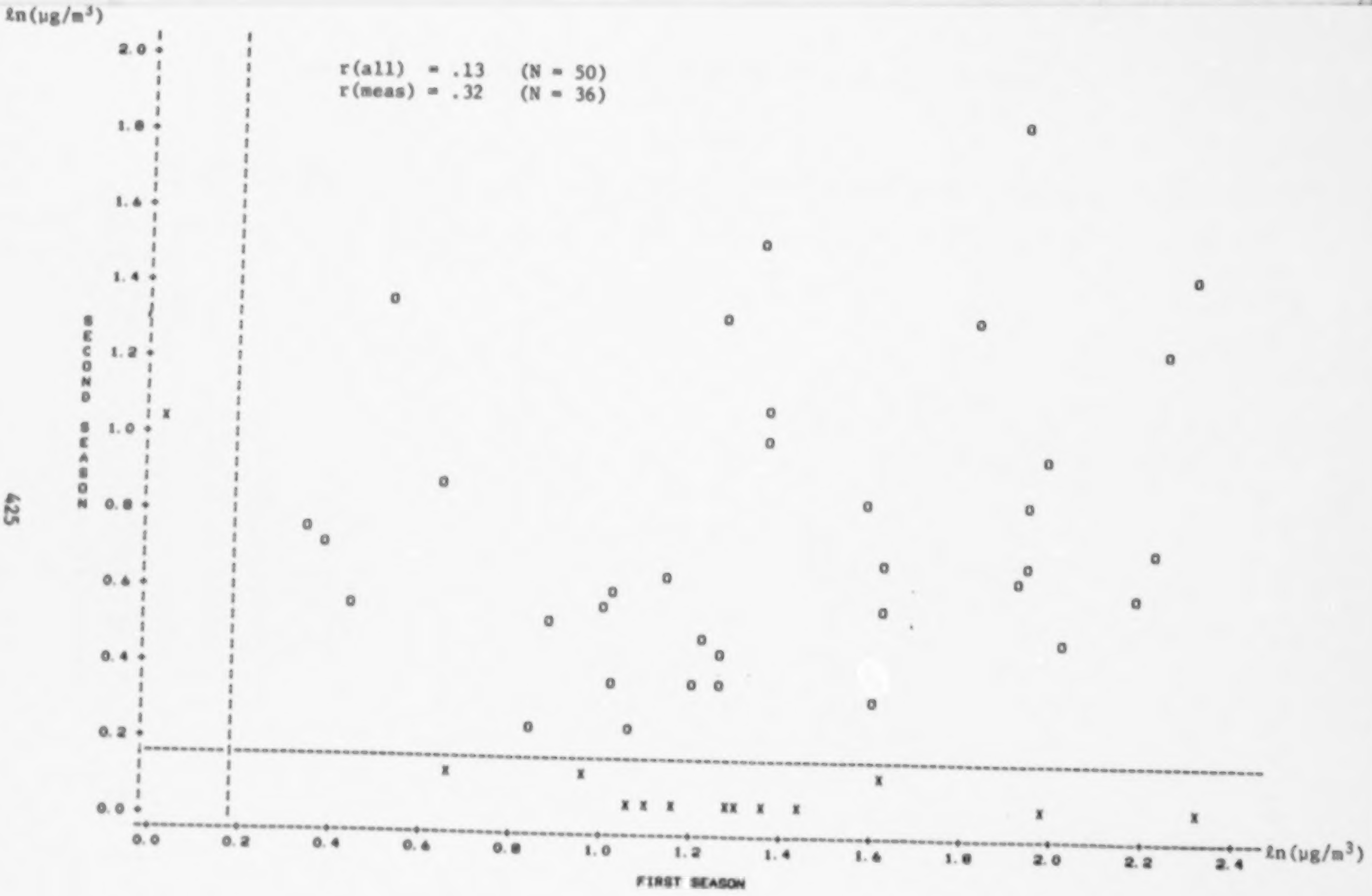

Figure 112. Styrene for overnight personal air - Los Angeles.

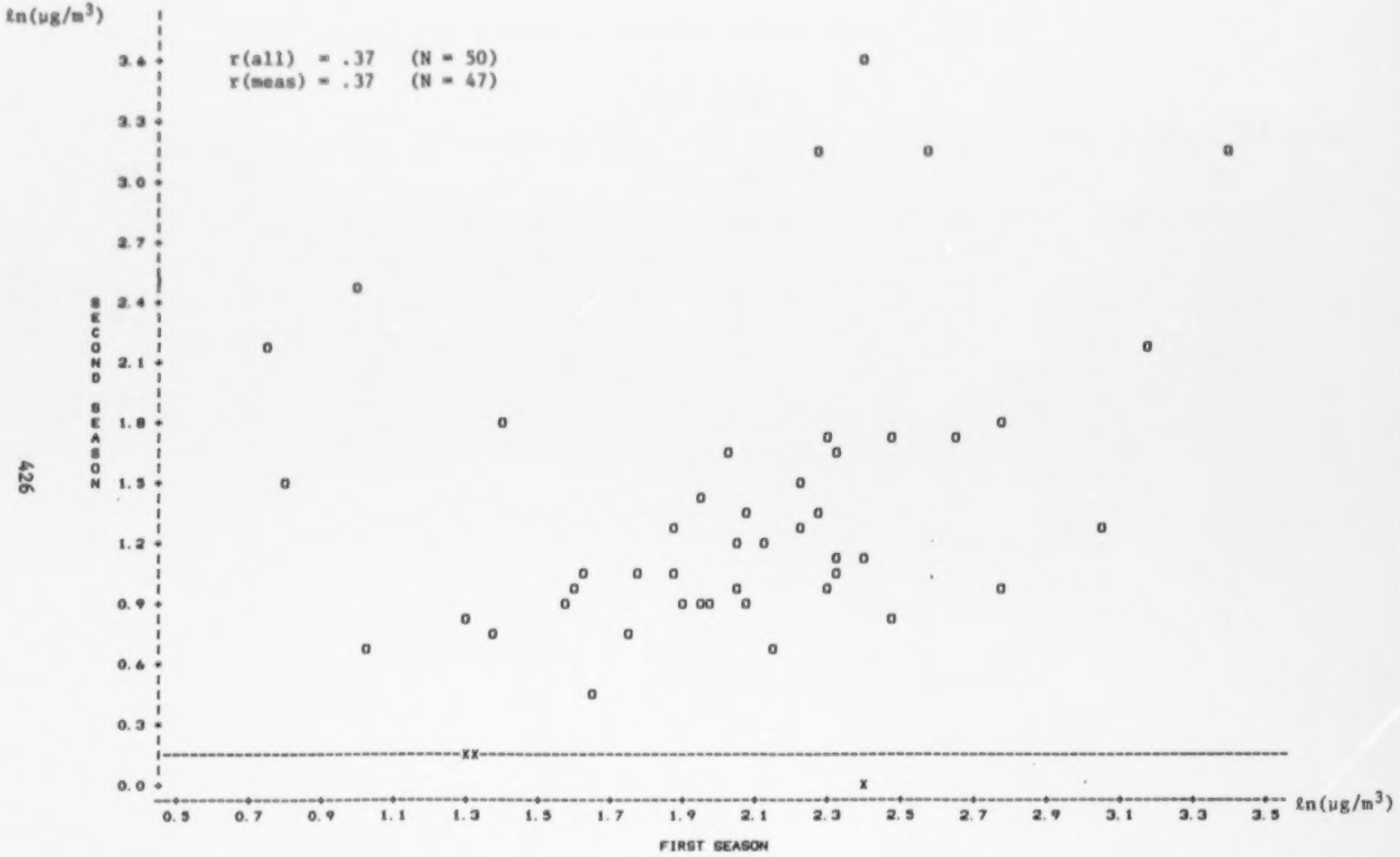

Figure 113. Ethylbenzene for overnight personal air - Los Angeles.

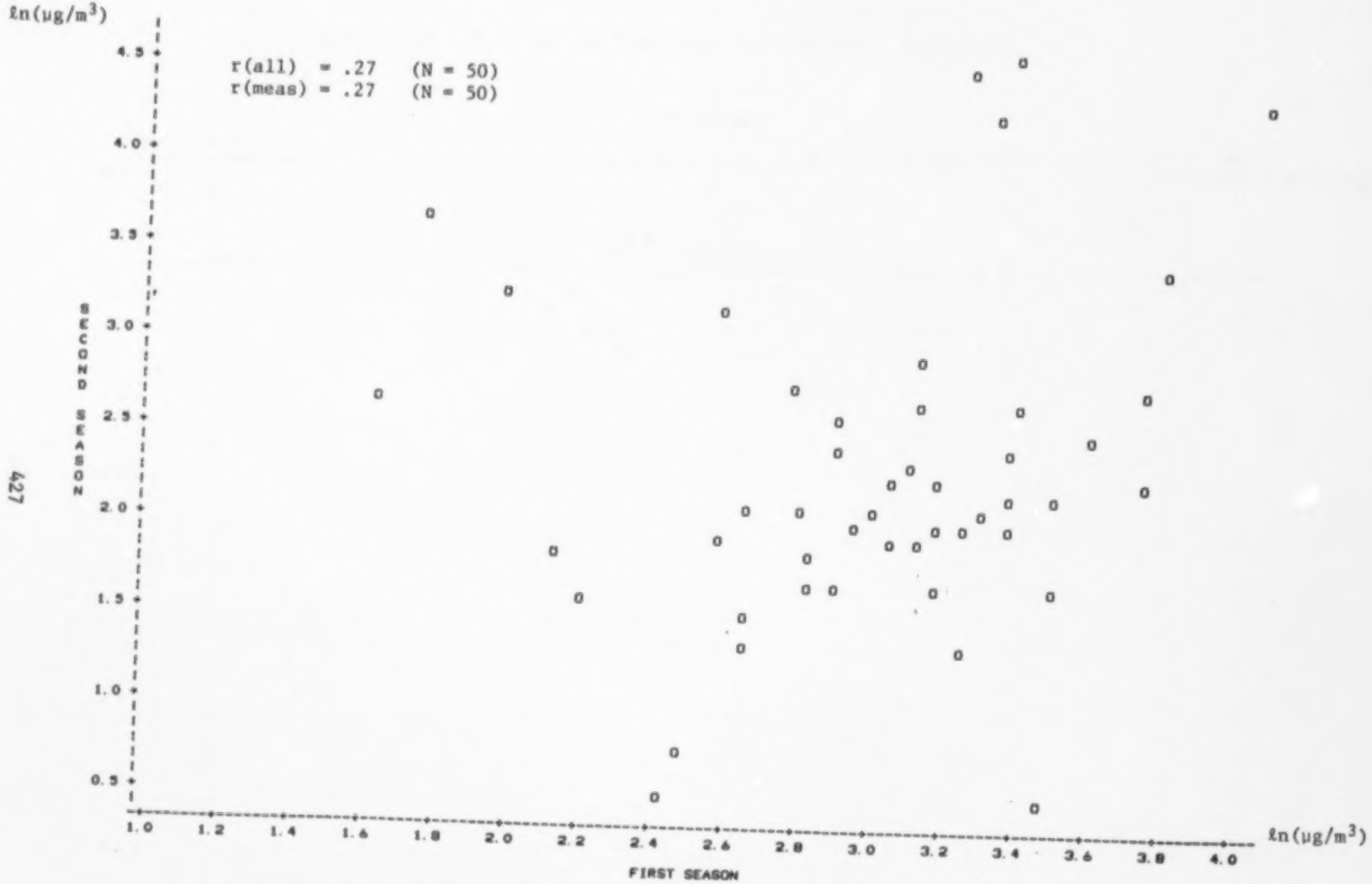

Figure 114. m,p-Xylene for overnight personal air - Los Angeles.

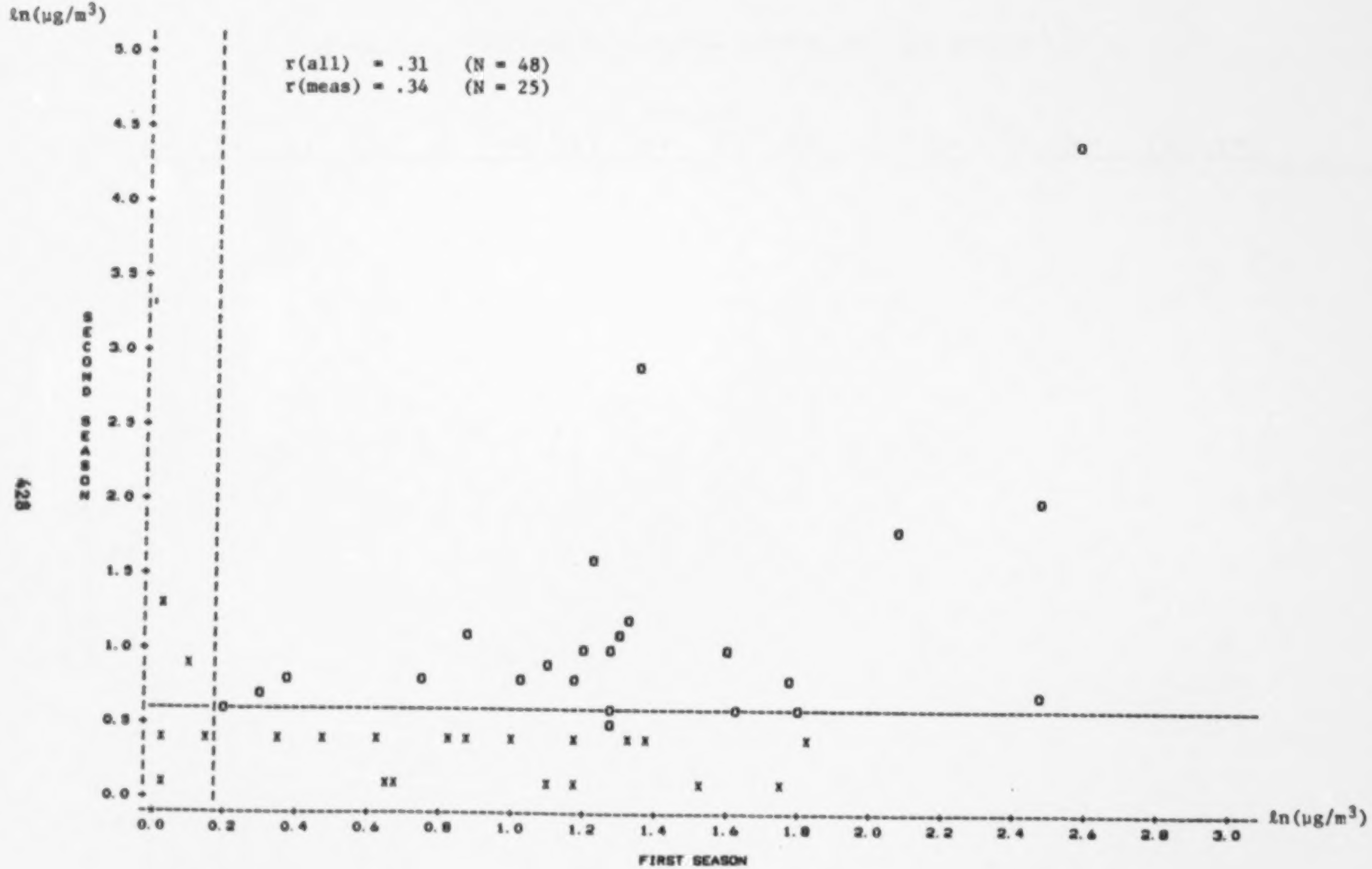

Figure 115. n-Decane for overnight personal air - Los Angeles.

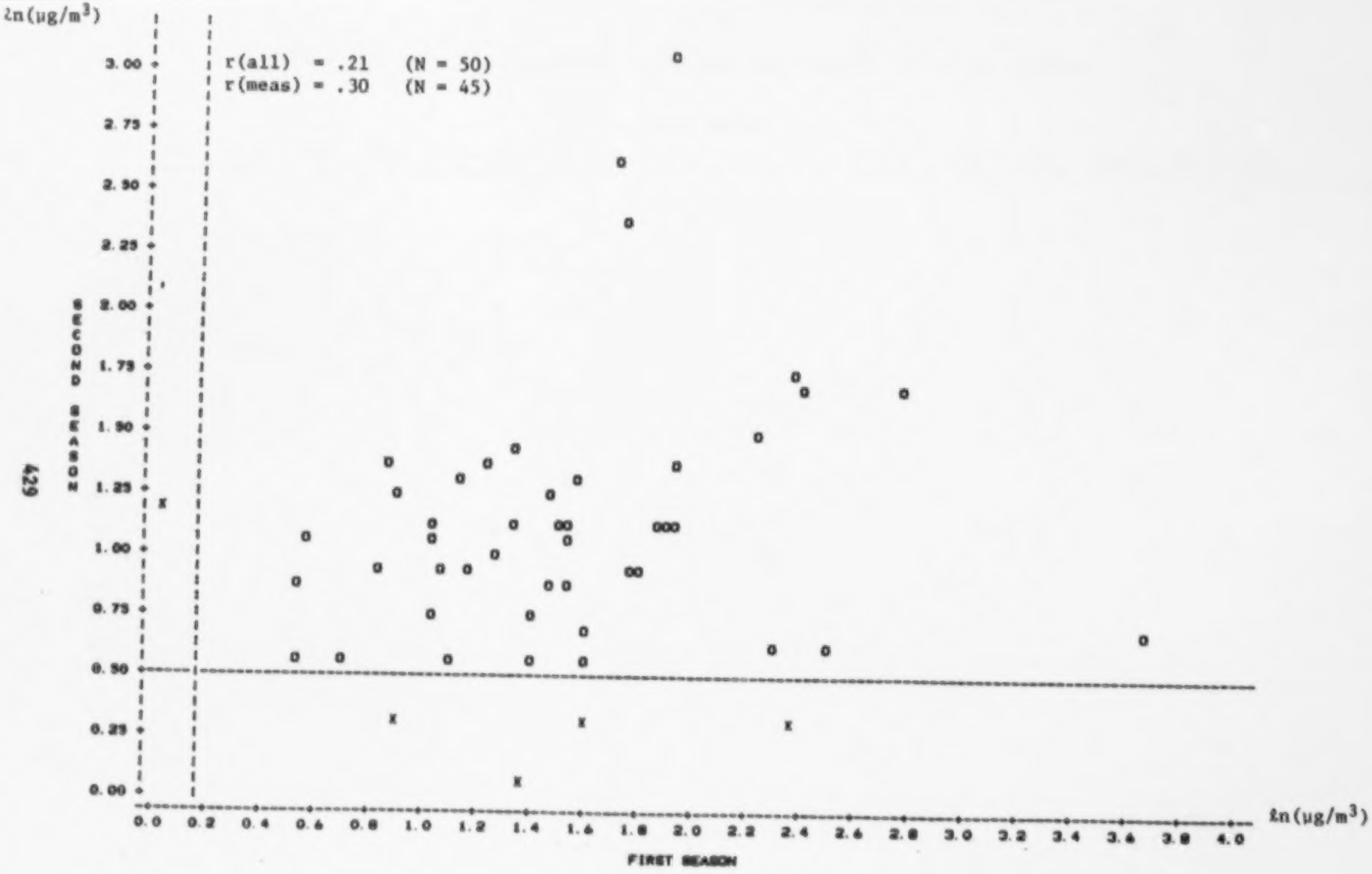

Figure 116. n-Octane for overnight personal air - Los Angeles.

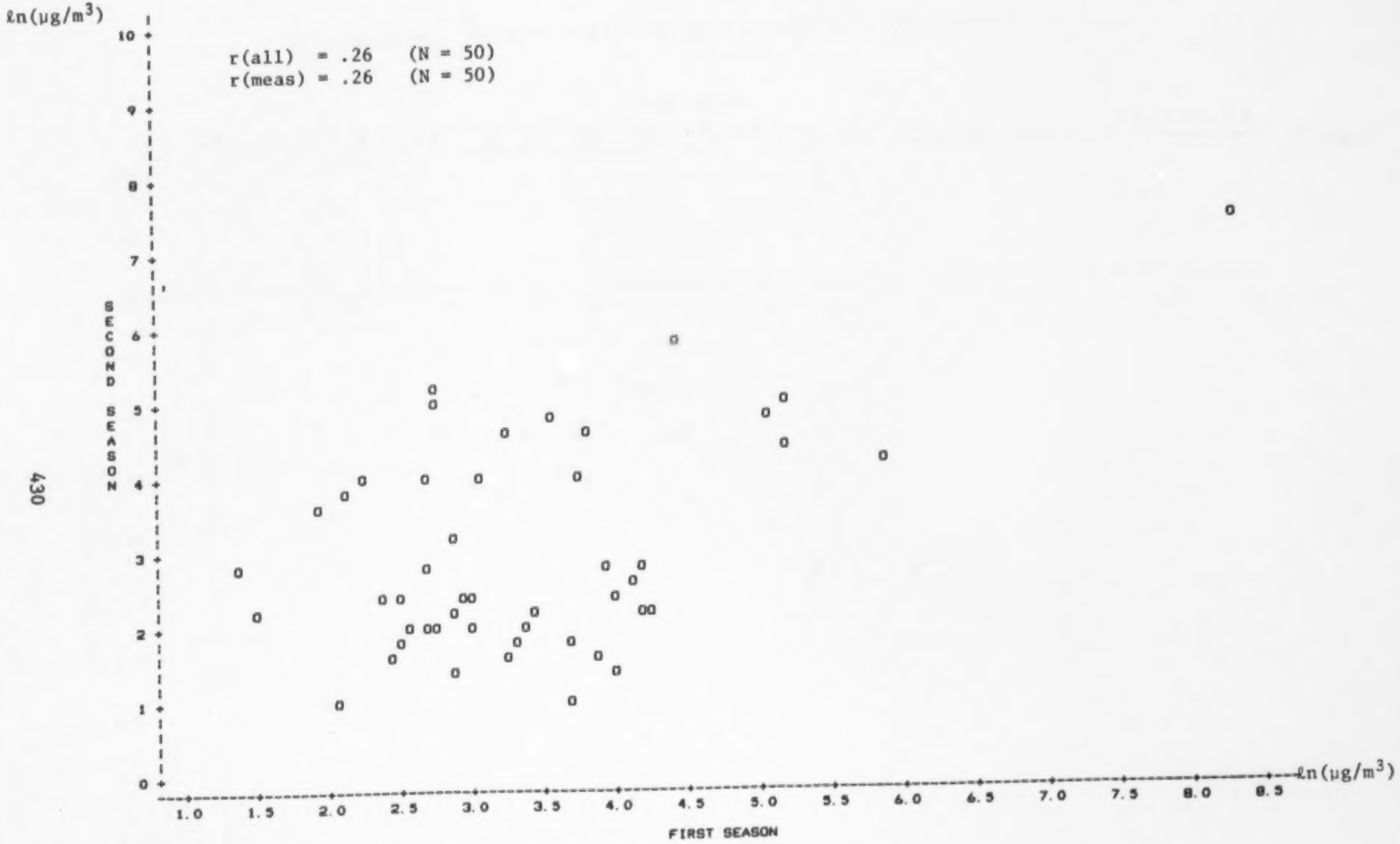

Figure 117. 1,1,1-Trichloroethane for daytime personal air - Los Angeles.

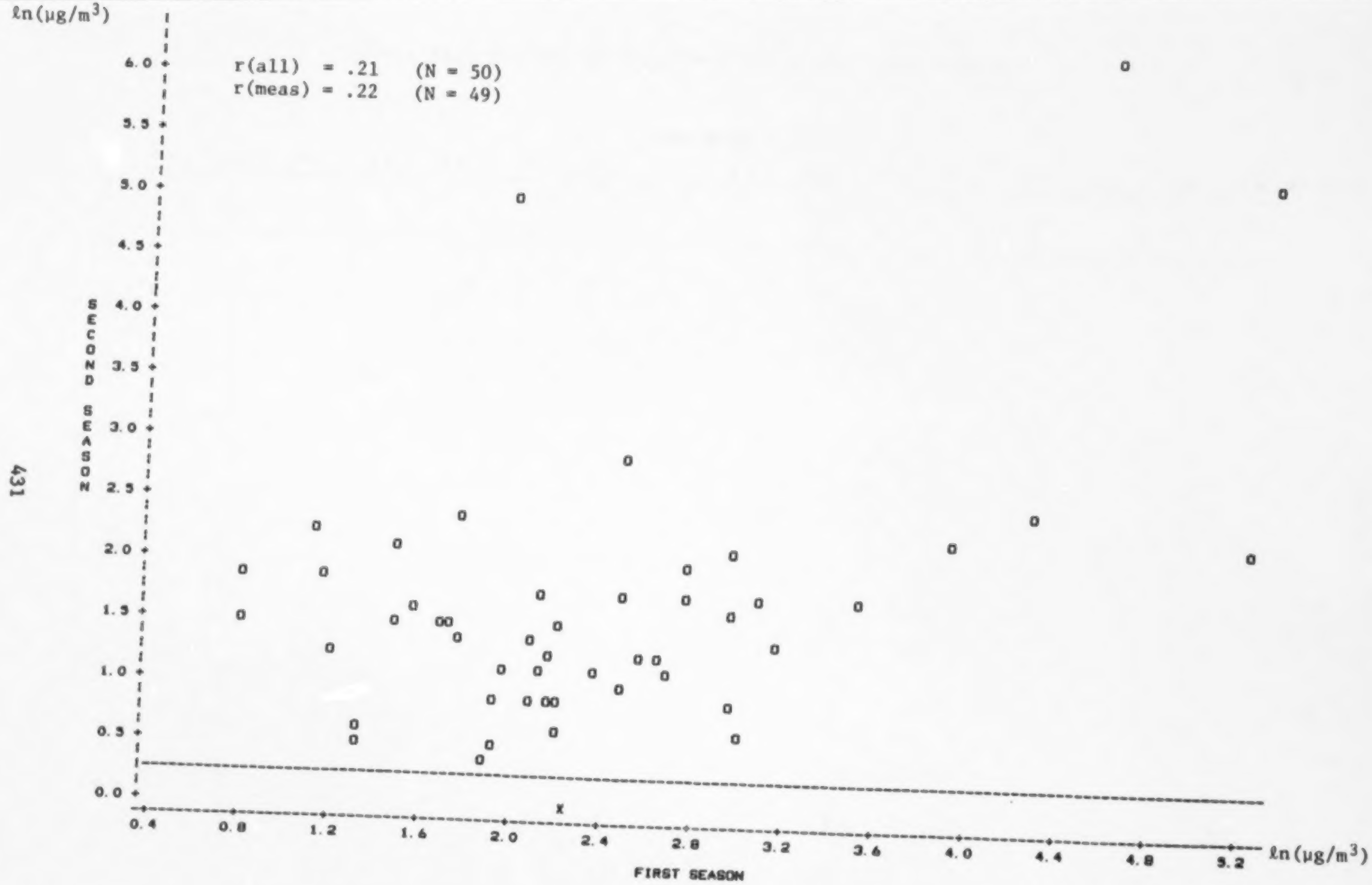

Figure 118. Tetrachloroethylene for daytime personal air Los Angeles.

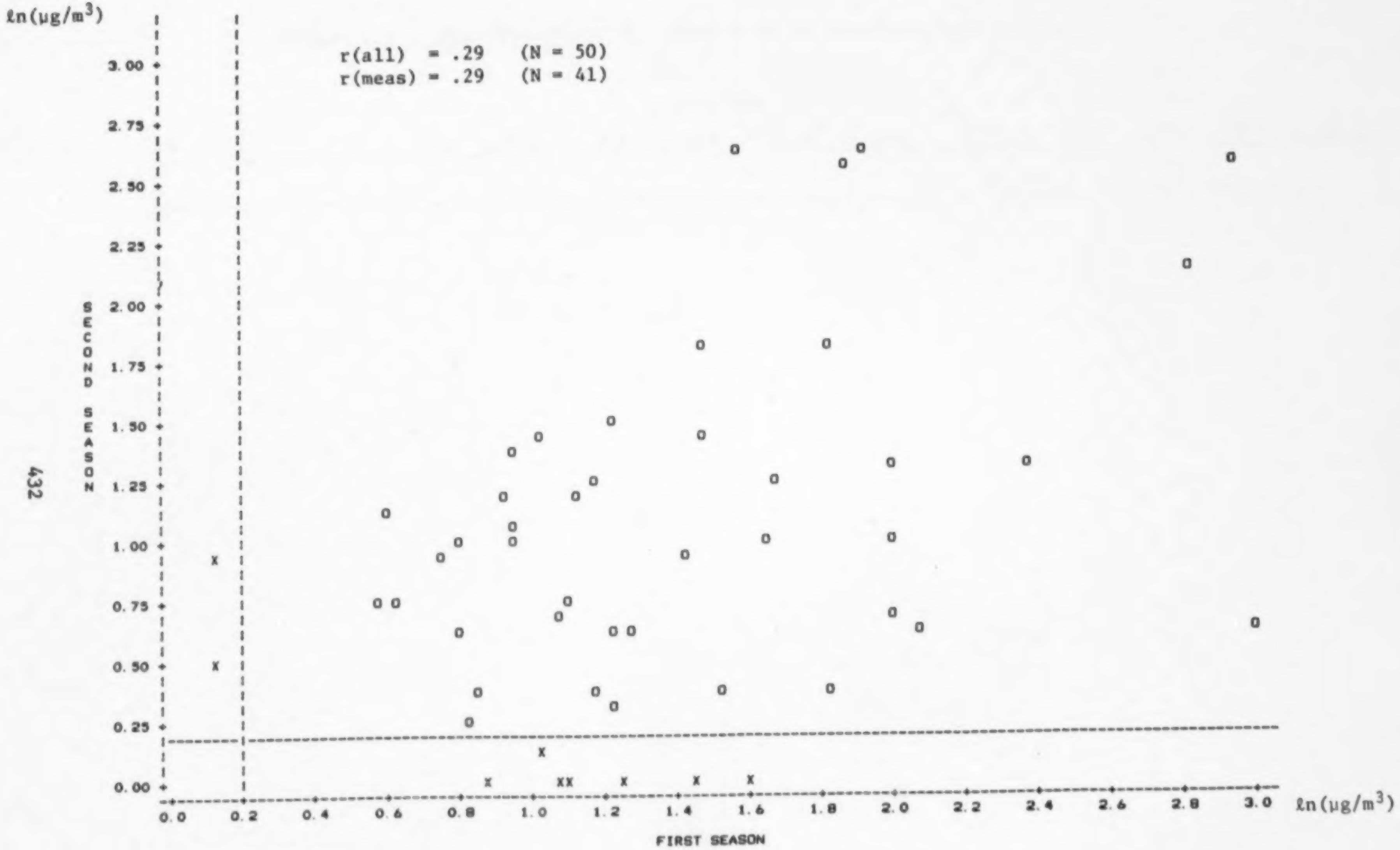

Figure 119. Styrene for daytime personal air - Los Angeles.

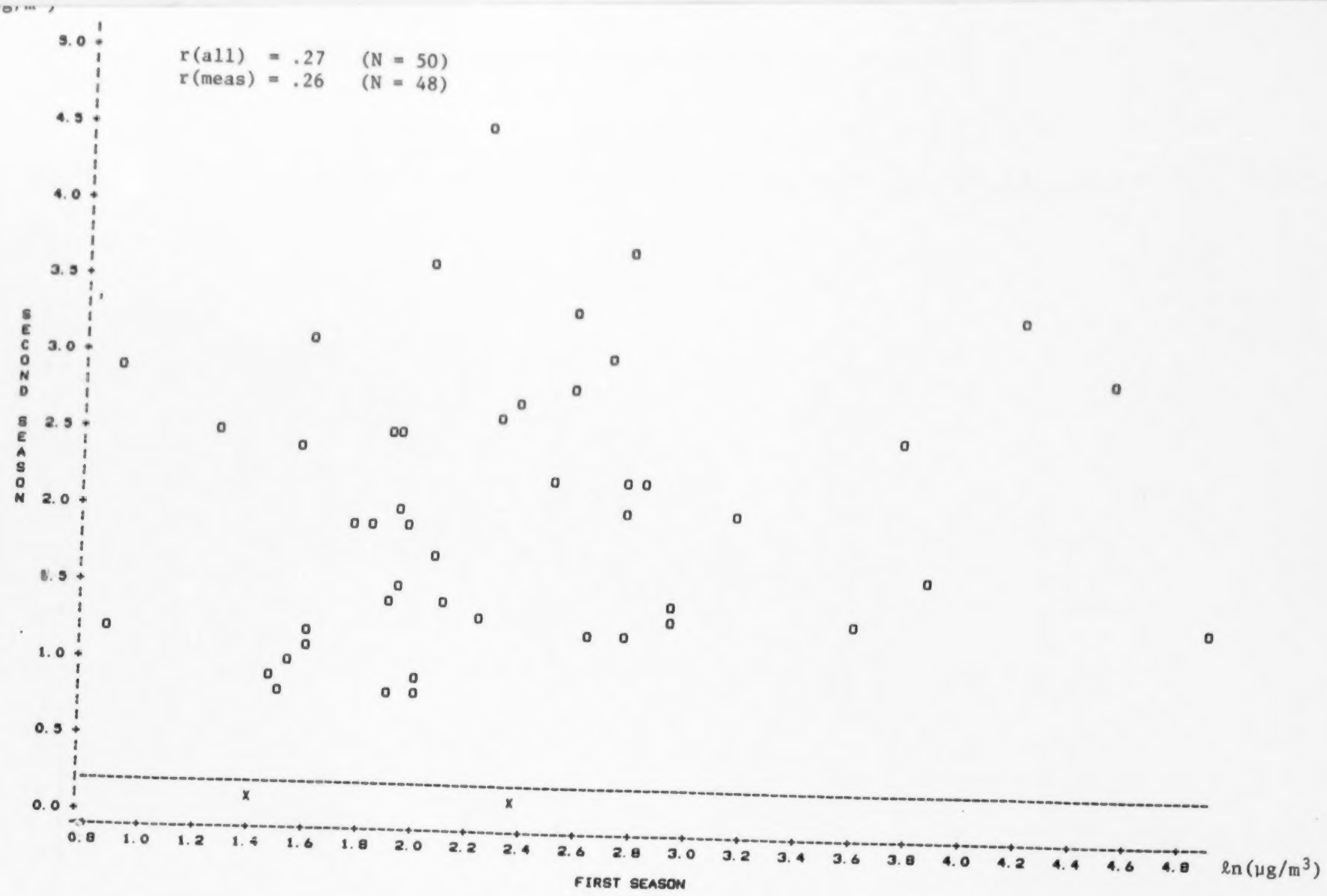

Figure 120. Ethylbenzene for daytime personal air - Los Angeles.

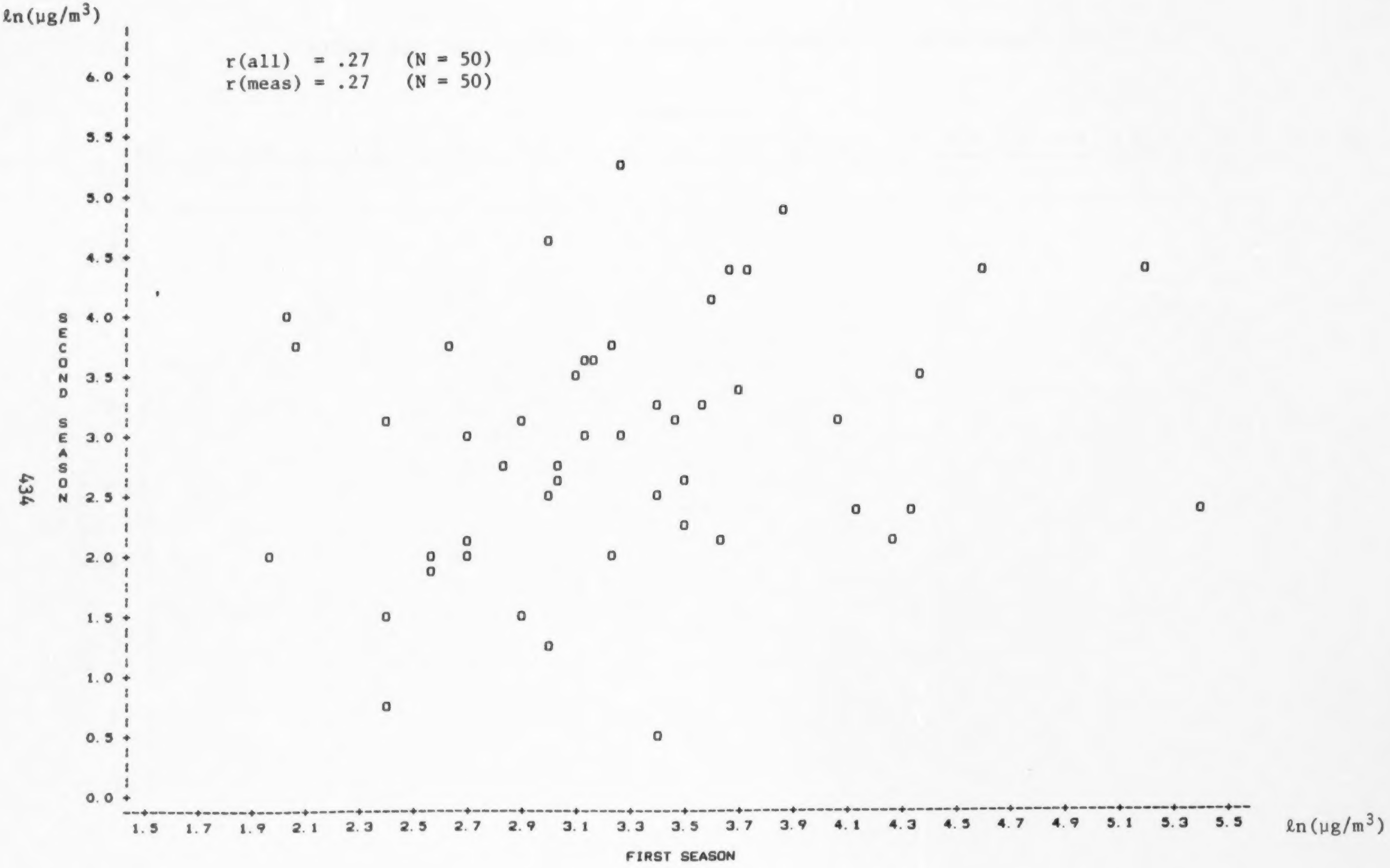

Figure 121. m,p-Xylene for daytime personal air - Los Angeles.

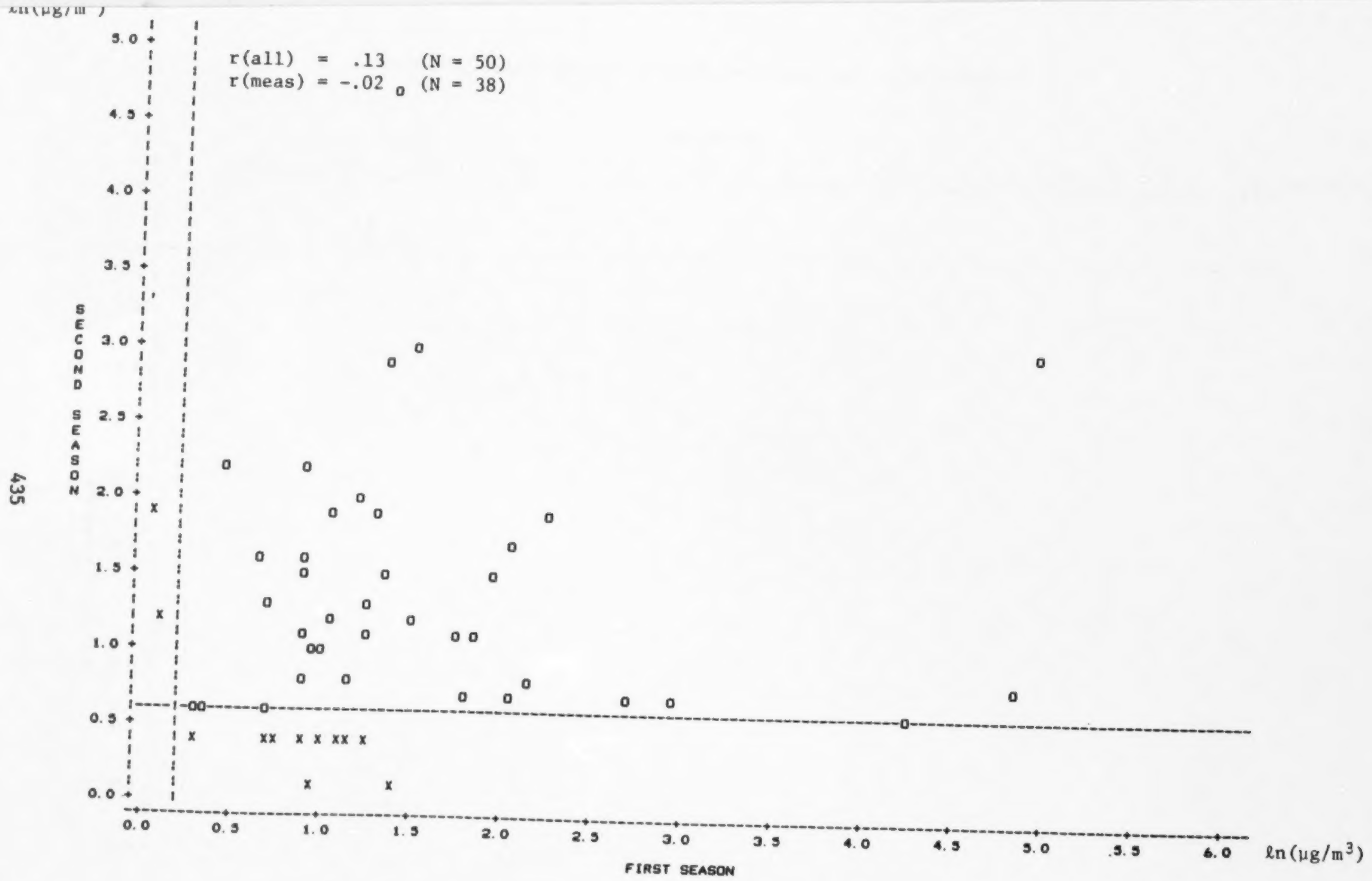

Figure 122. n-Decane for daytime personal air - Los Angeles.

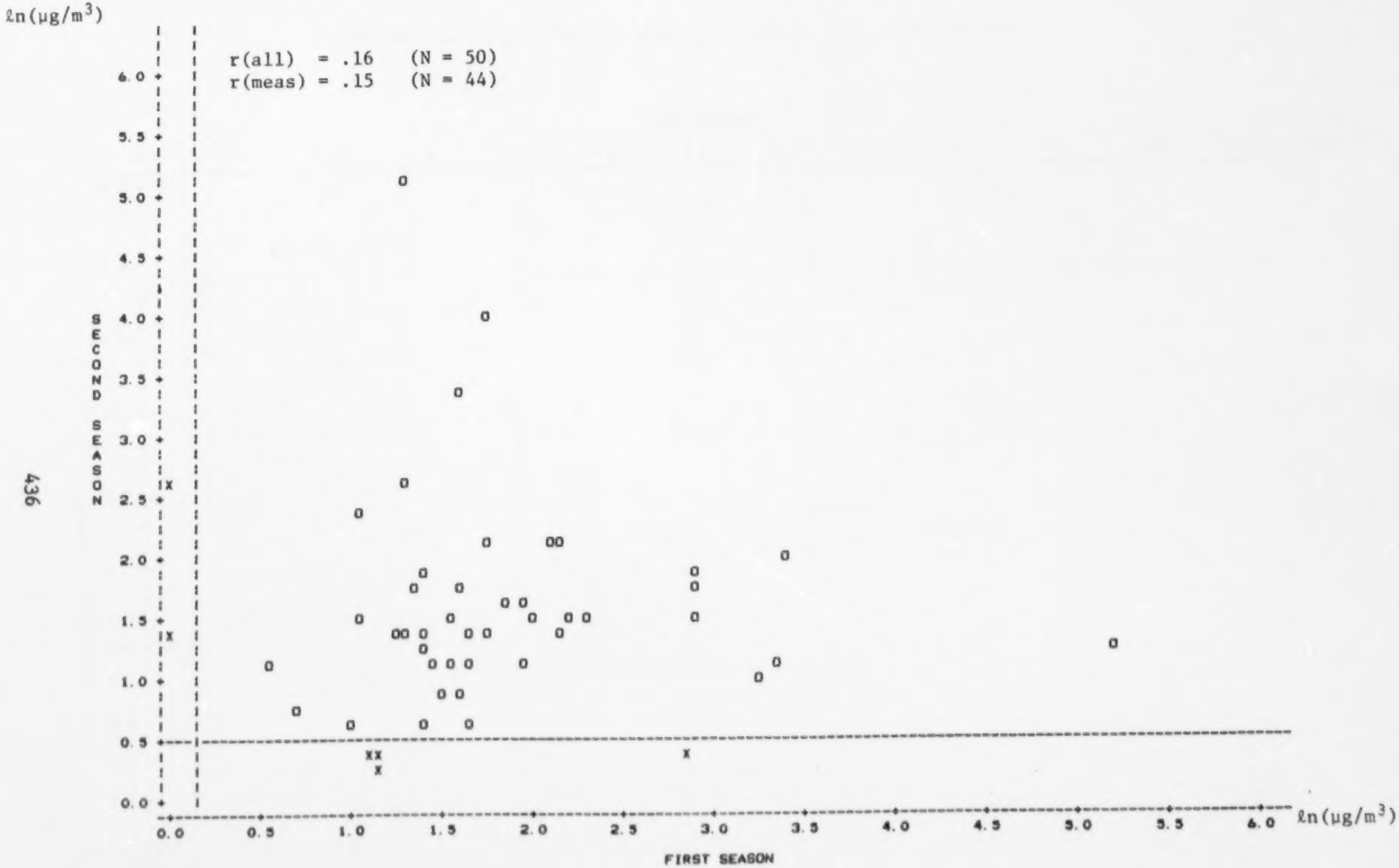

Figure 123. n-Octane for daytime personal air - Los Angeles.

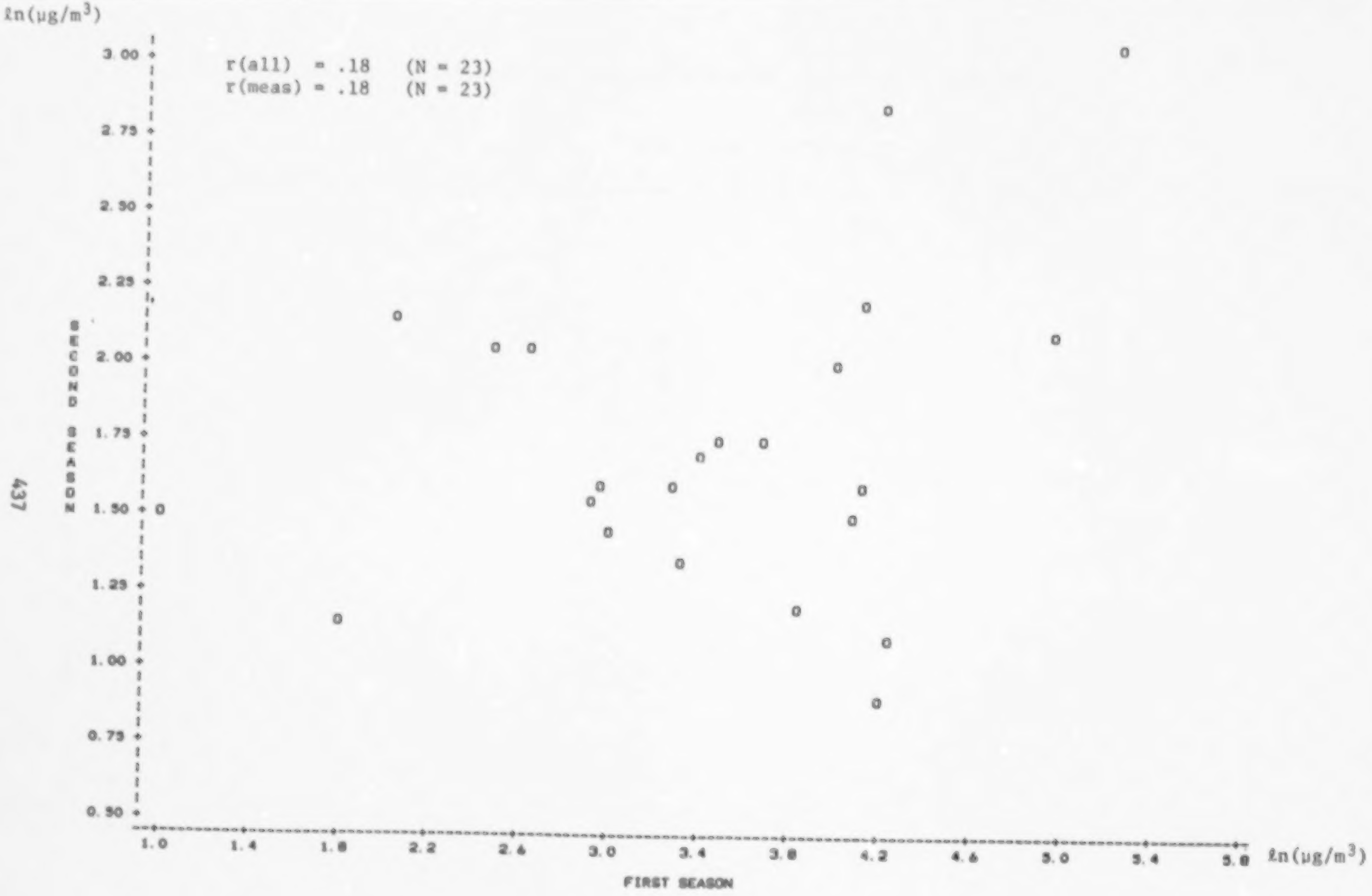

Figure 124. 1,1,1-Trichloroethane for overnight outdoor air - Los Angeles.

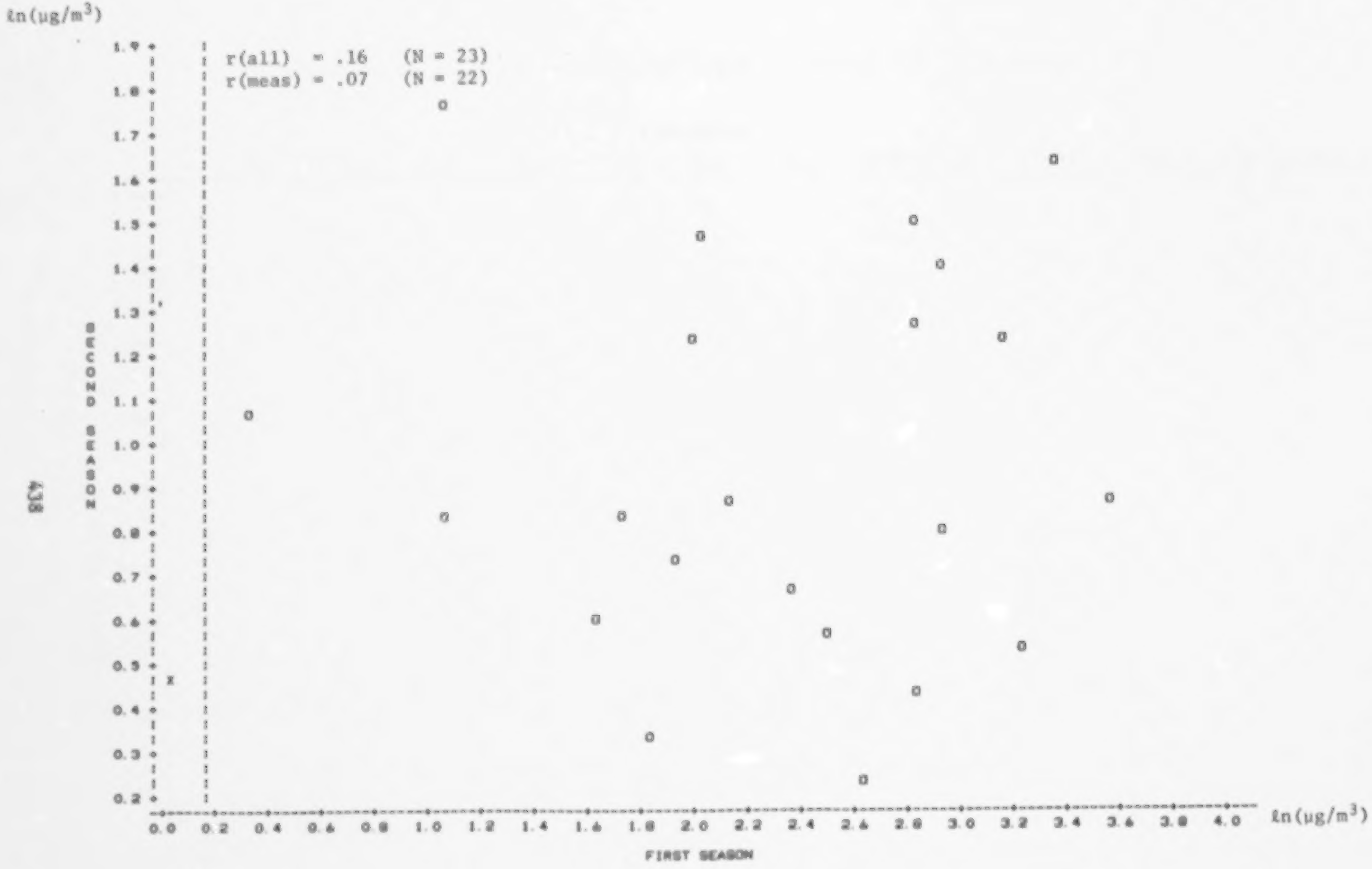

Figure 125. Tetrachloroethylene for overnight outdoor air - Los Angeles.

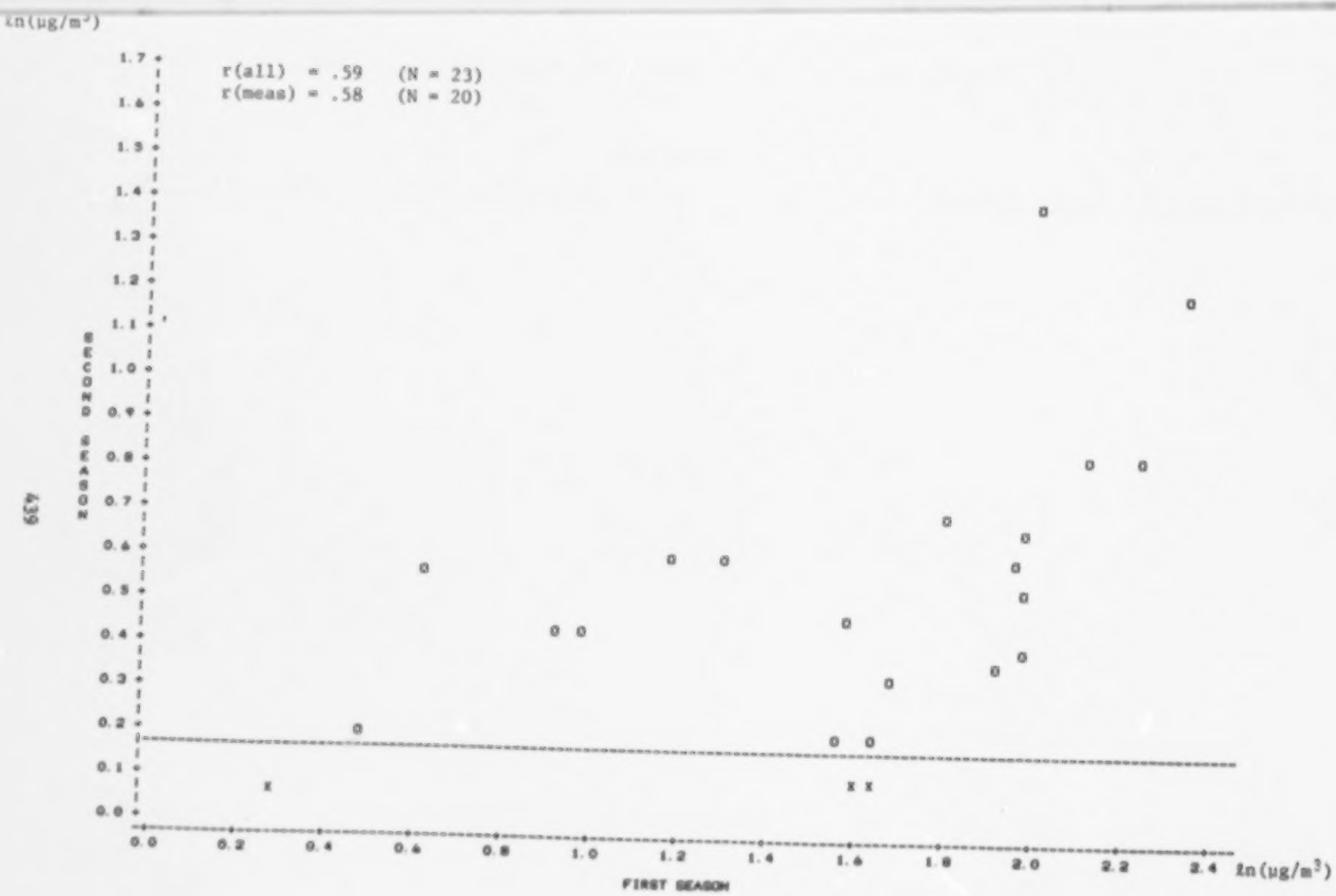

Figure 126. Styrene for overnight outdoor air - Los Angeles.

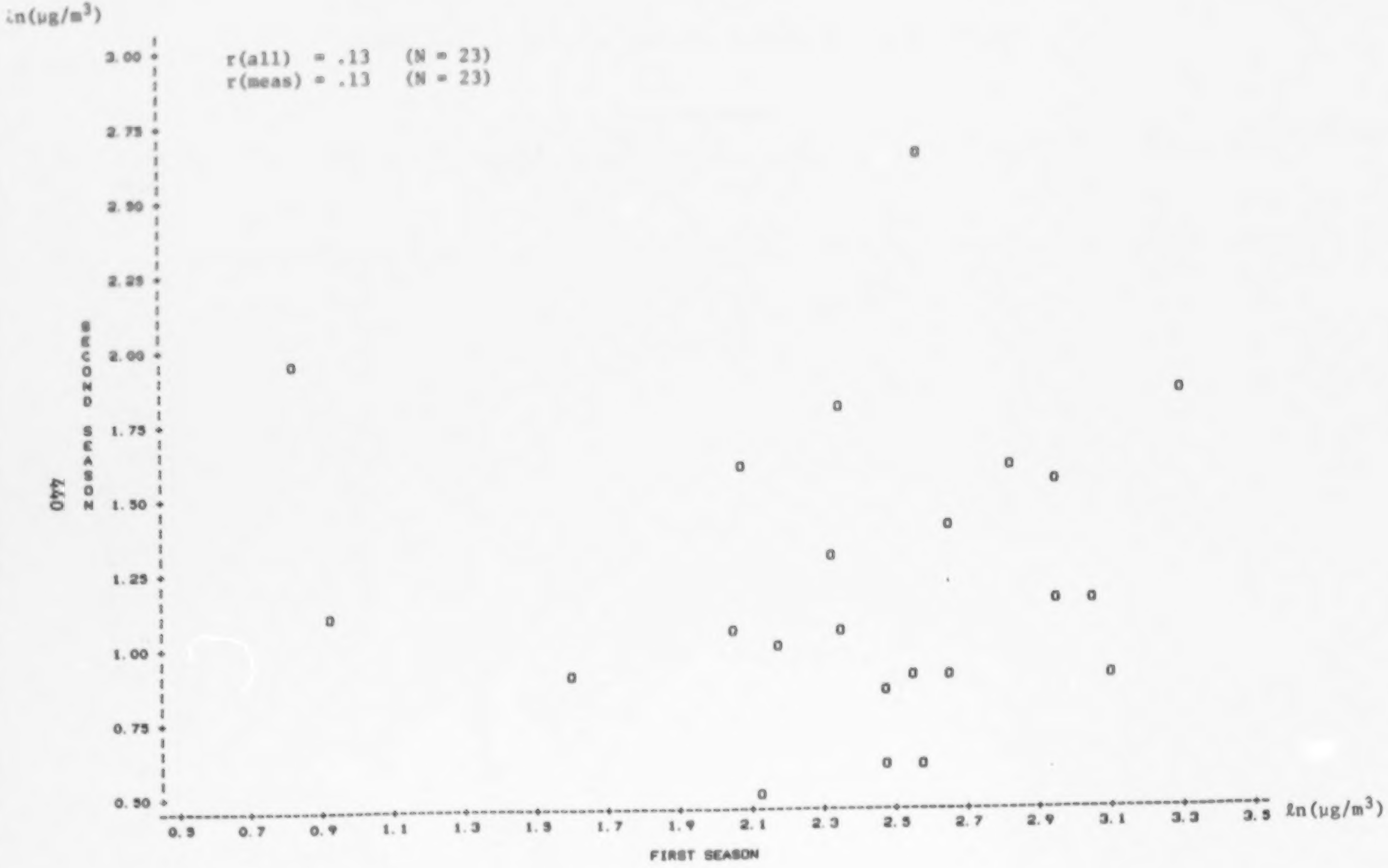

Figure 127. Ethylbenzene for overnight outdoor air - Los Angeles.

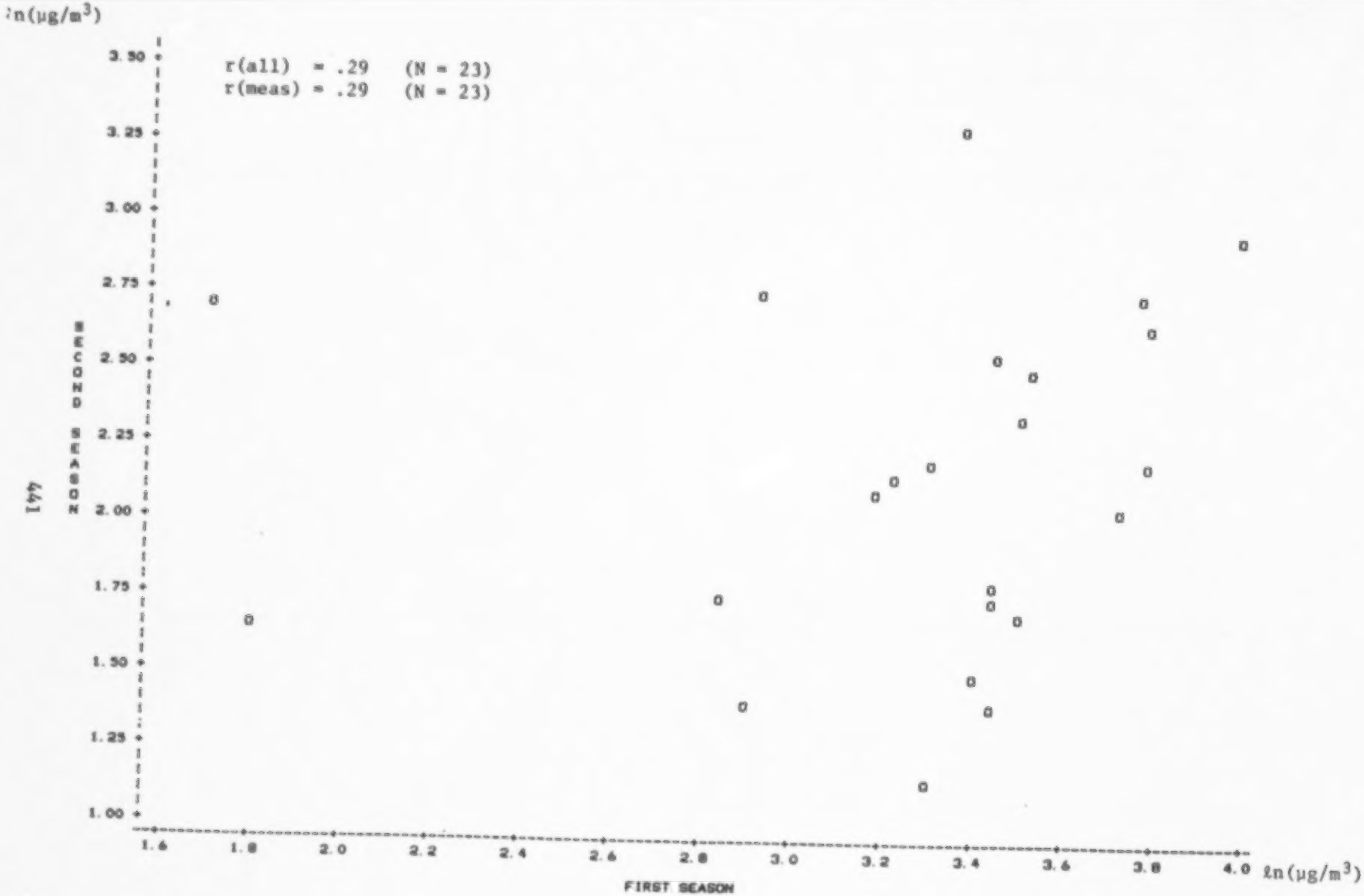

Figure 128. m,p-Xylene for overnight outdoor air - Los Angeles.

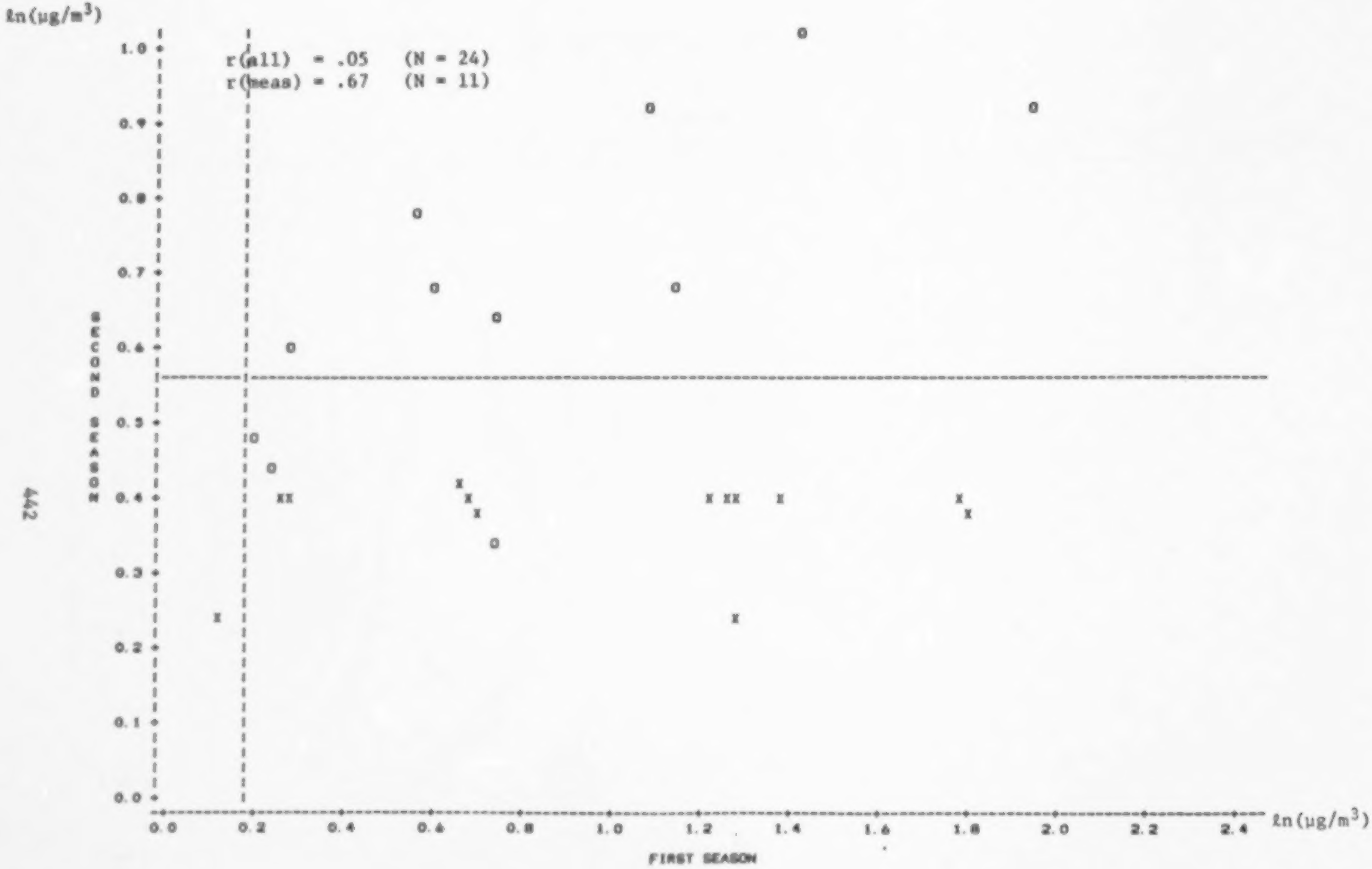

Figure 129. n-Decane for daytime outdoor air - Los Angeles.

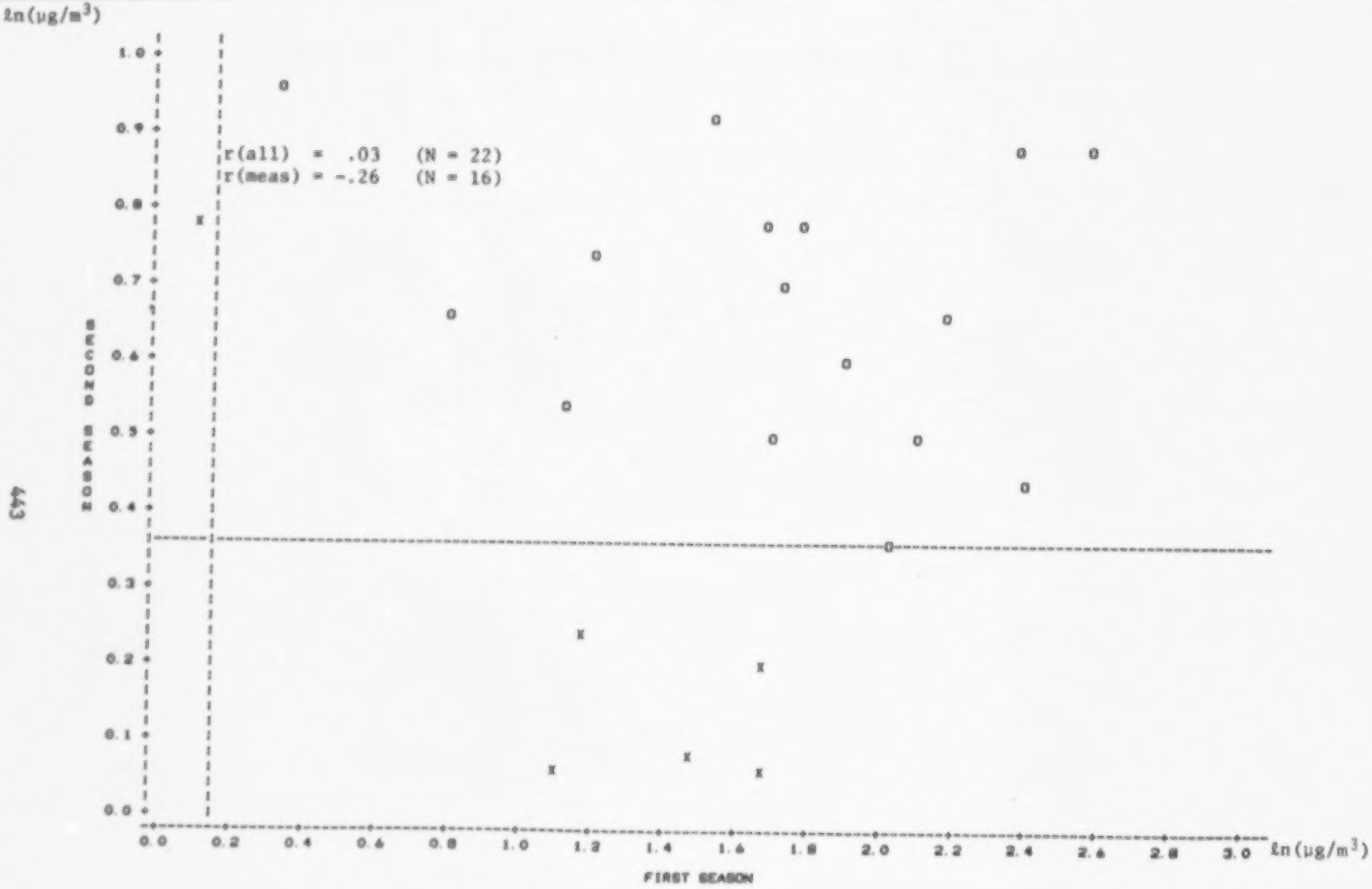

Figure 130. n-Octane for overnight outdoor air - Los Angeles.

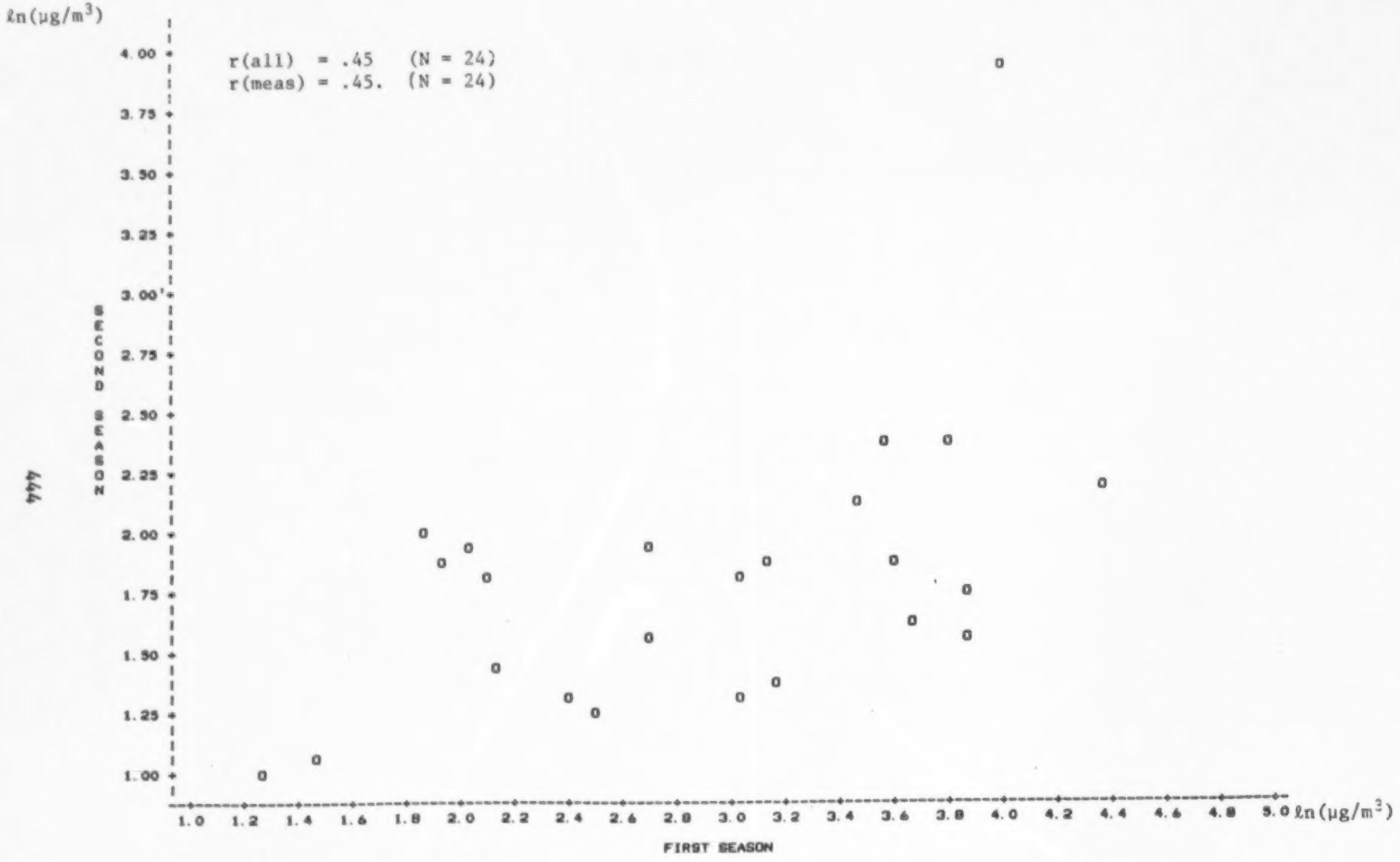

Figure 131. 1,1,1-Trichloroethane for daytime outdoor air - Los Angeles.

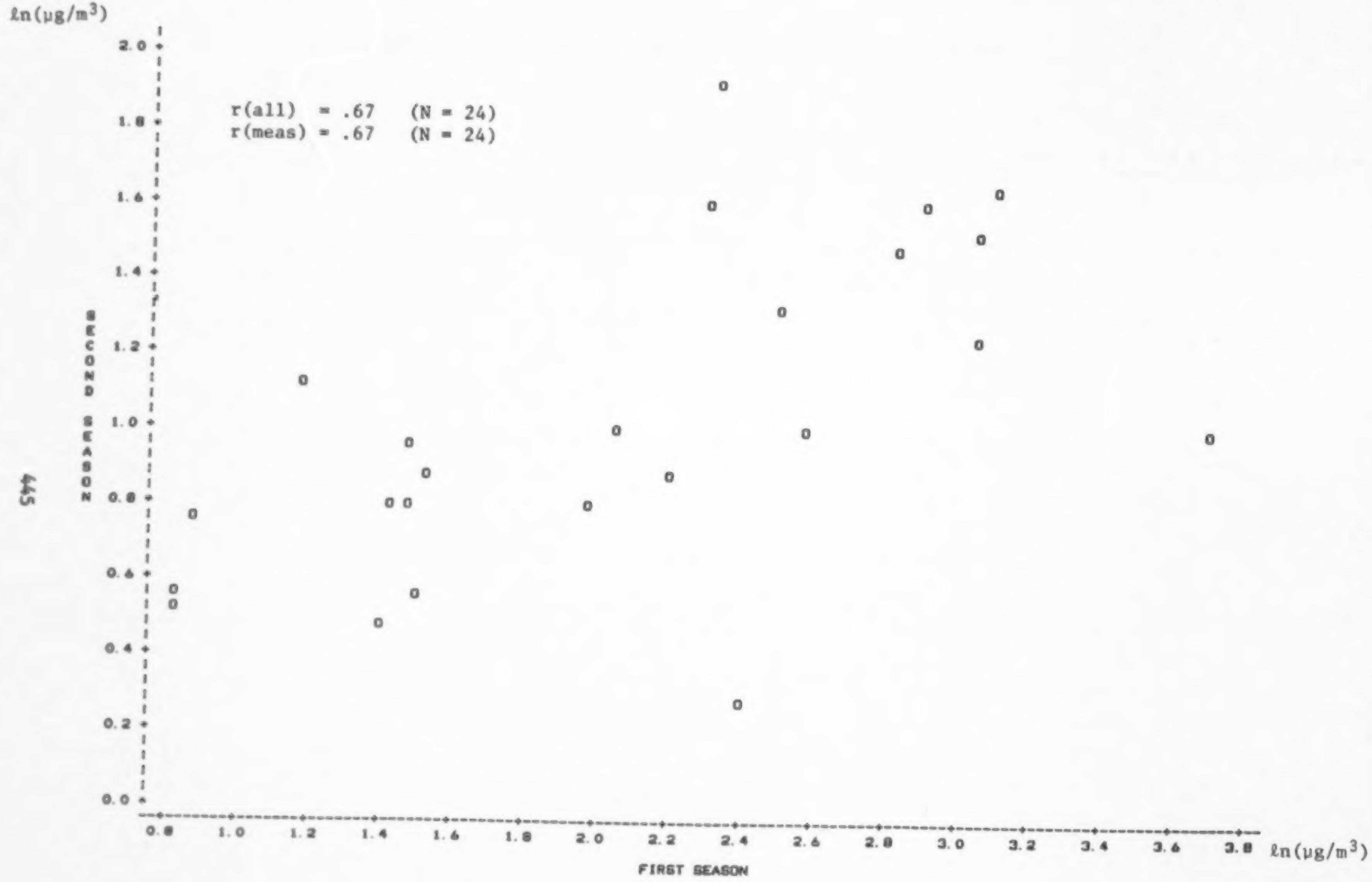

Figure 132. Tetrachloroethylene for daytime outdoor air - Los Angeles.

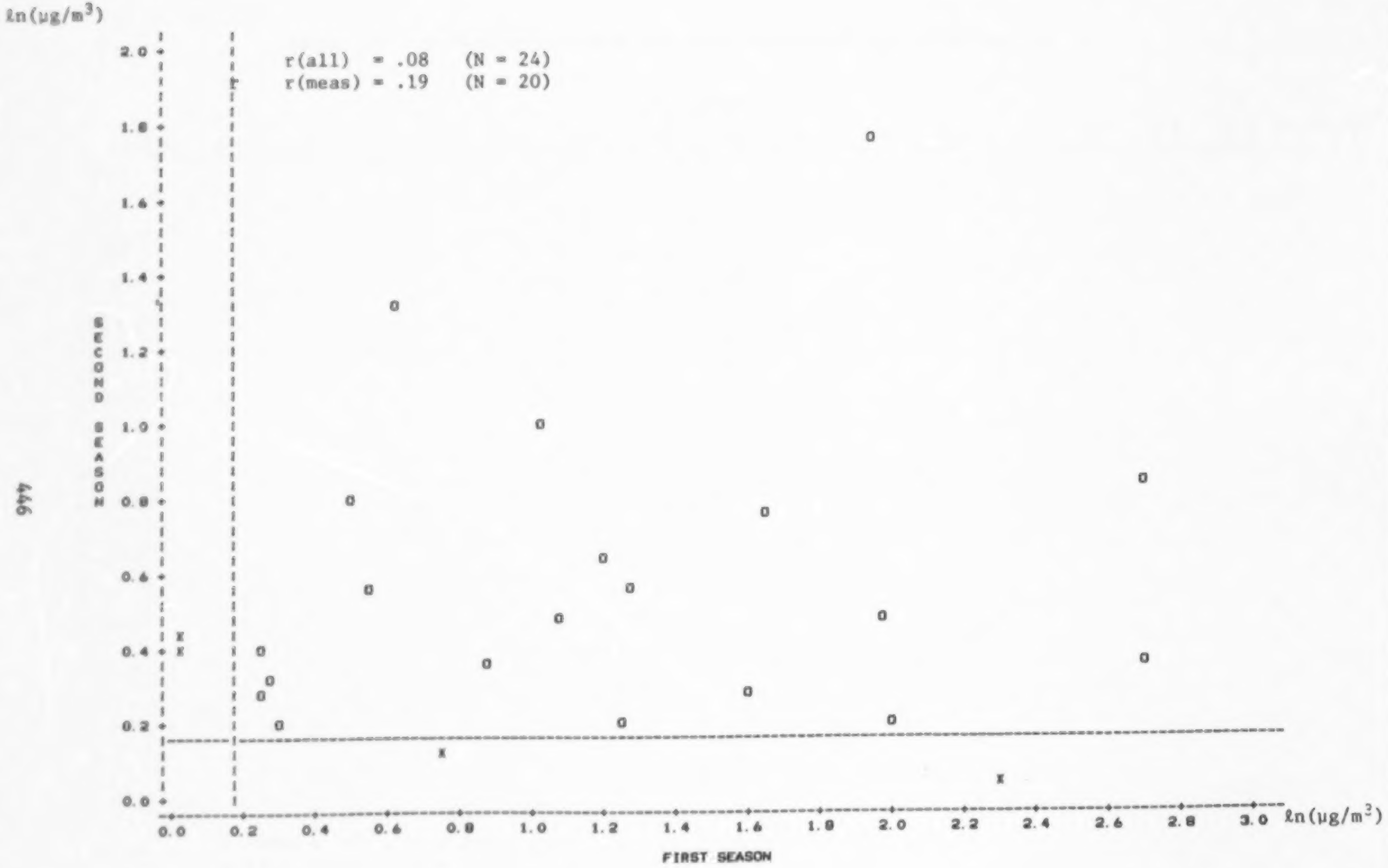

Figure 133. Styrene for daytime outdoor air - Los Angeles.

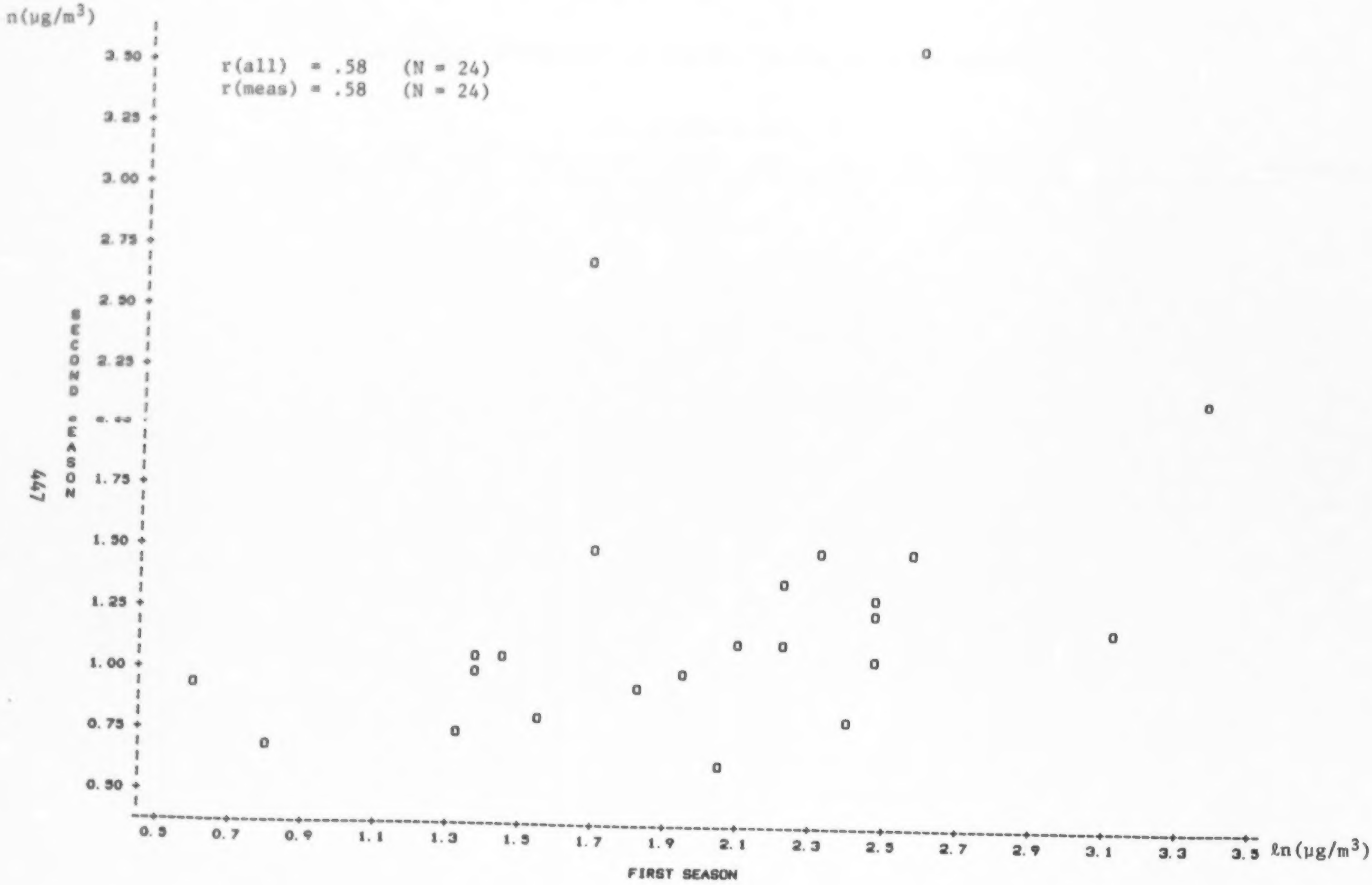

Figure 134. Ethylbenzene for daytime outdoor air - Los Angeles.

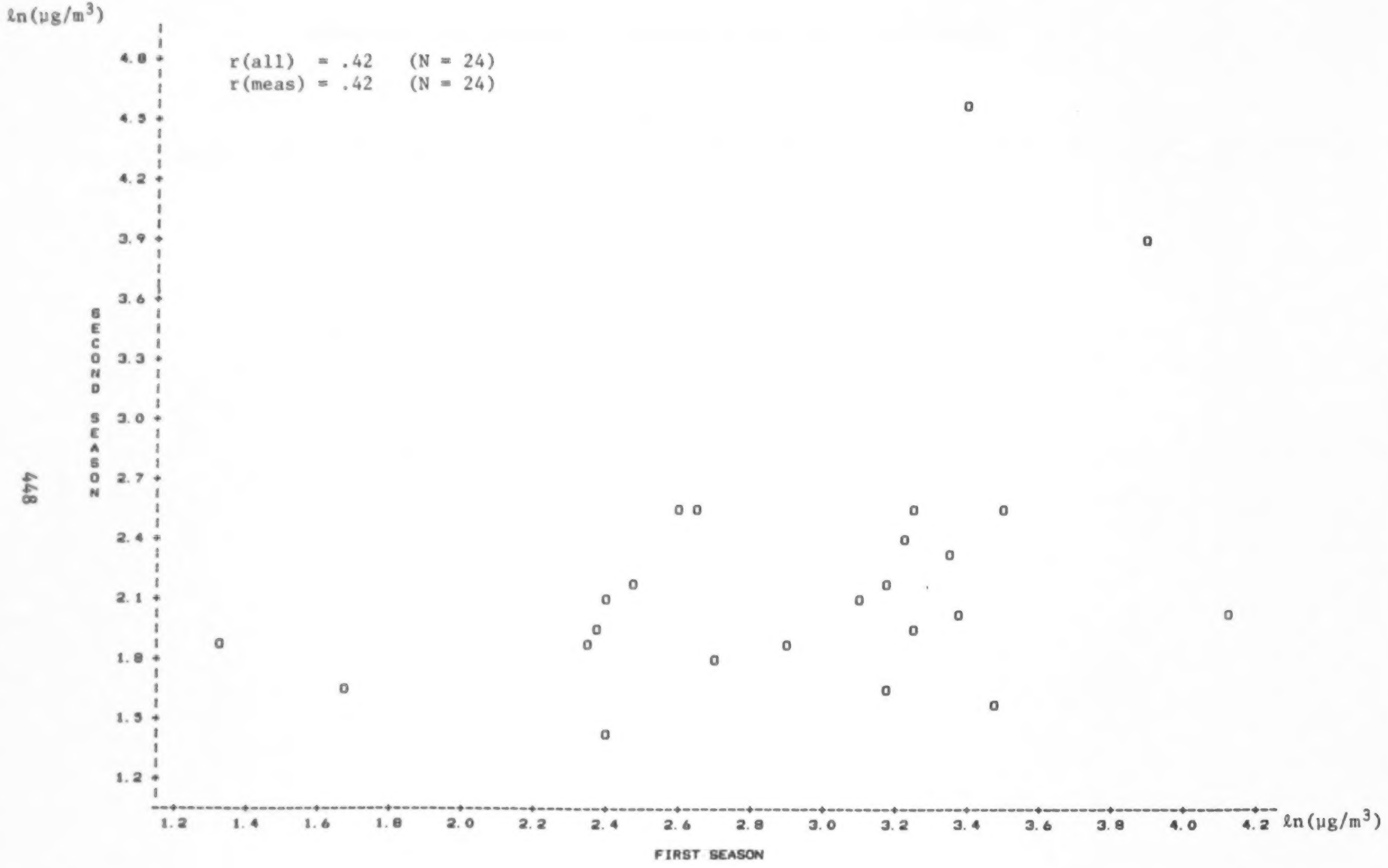

Figure 135. m,p-Xylene for daytime outdoor air - Los Angeles.

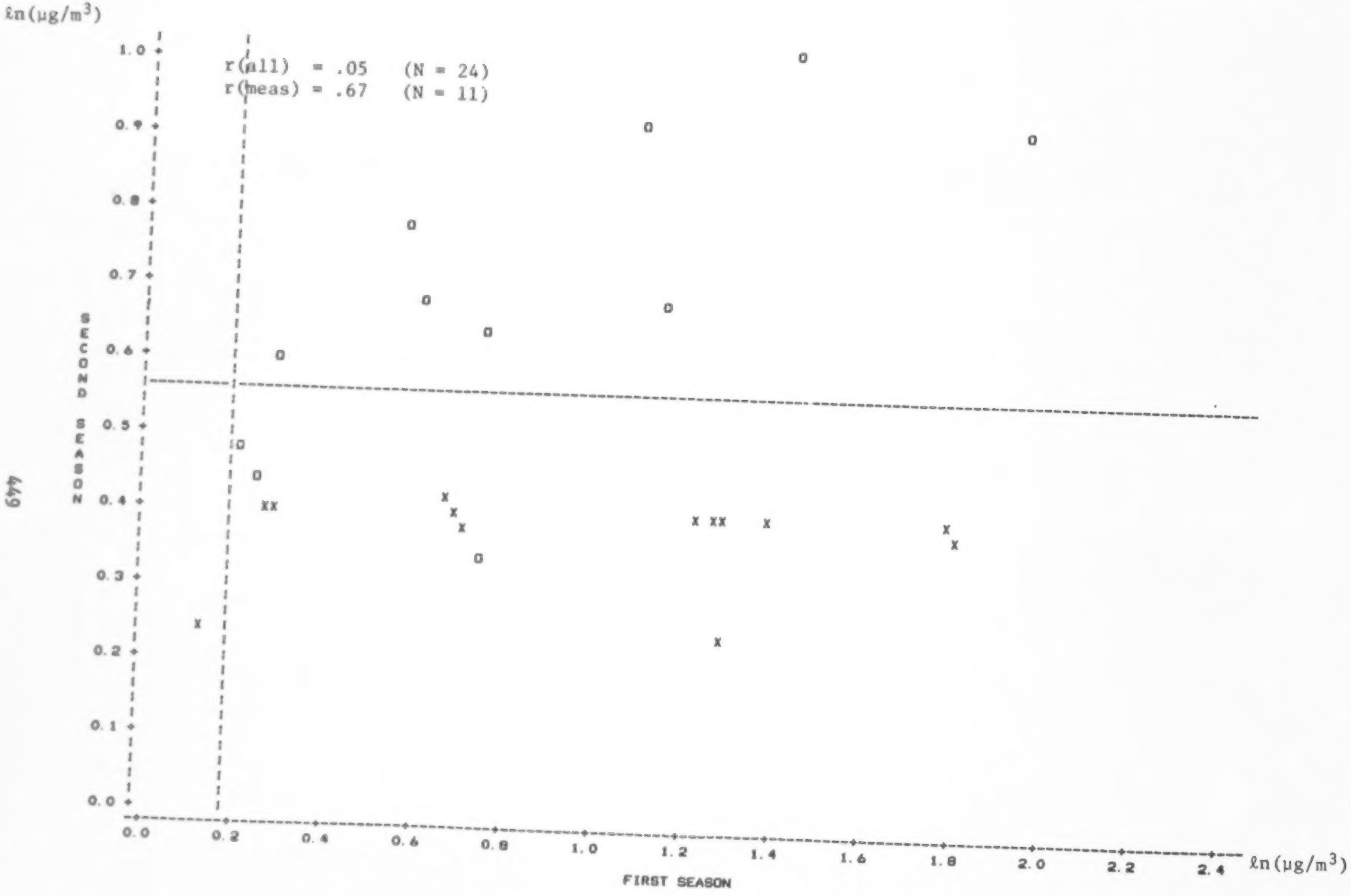

Figure 136. n-Decane for daytime outdoor air - Los Angeles.

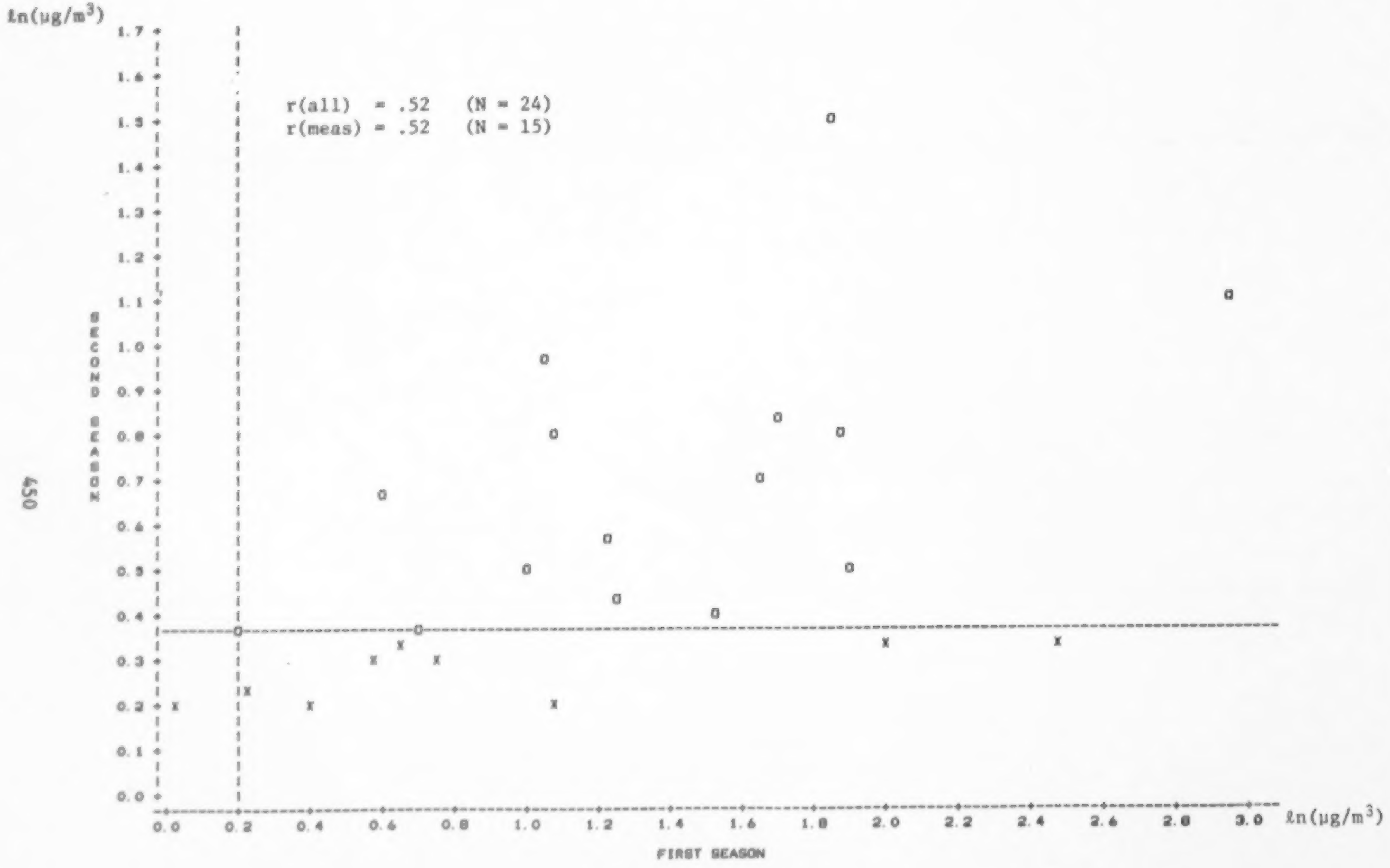

Figure 137. n-Octane for daytime outdoor air - Los Angeles.

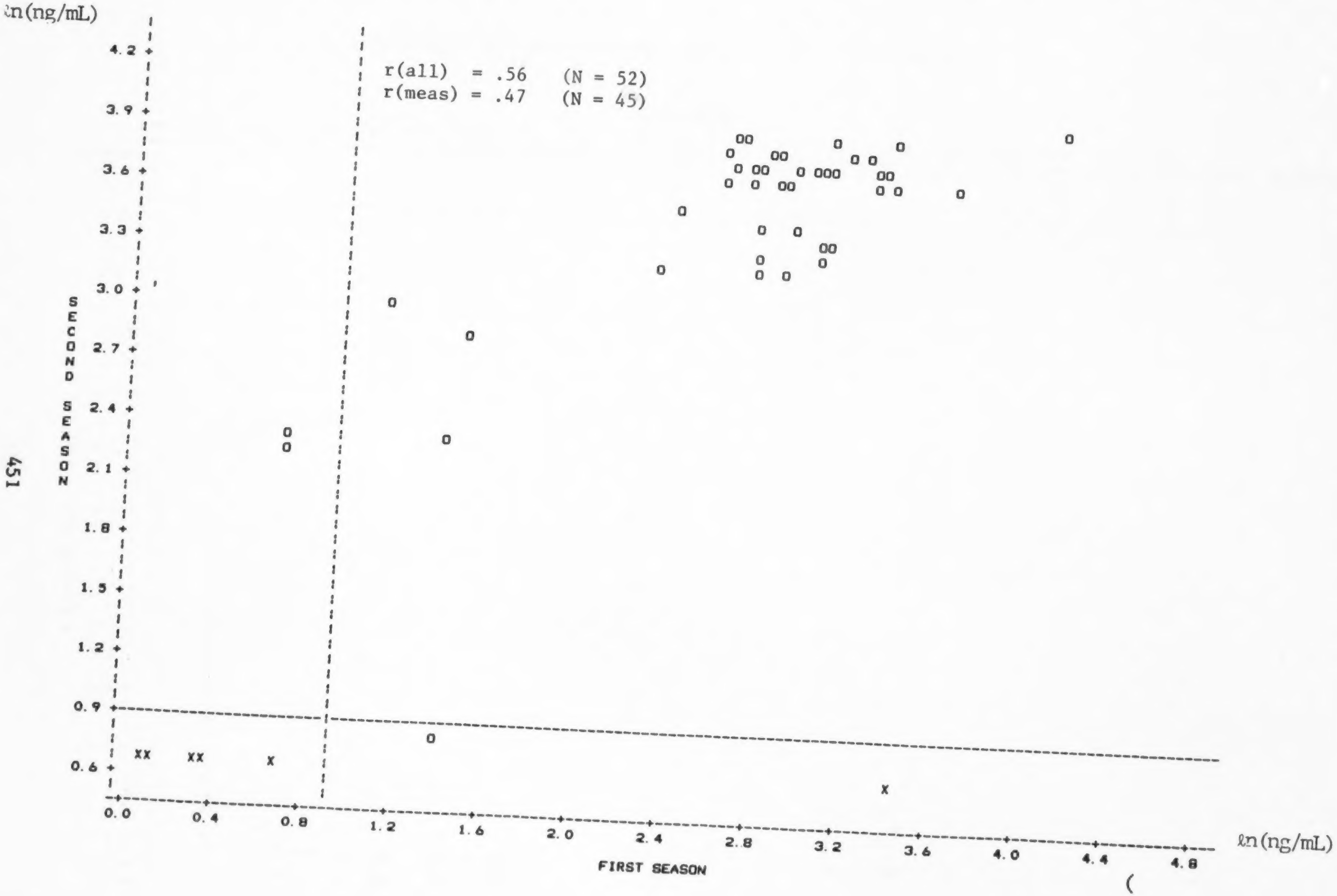

Figure 138. Chloroform for water - Los Angeles.

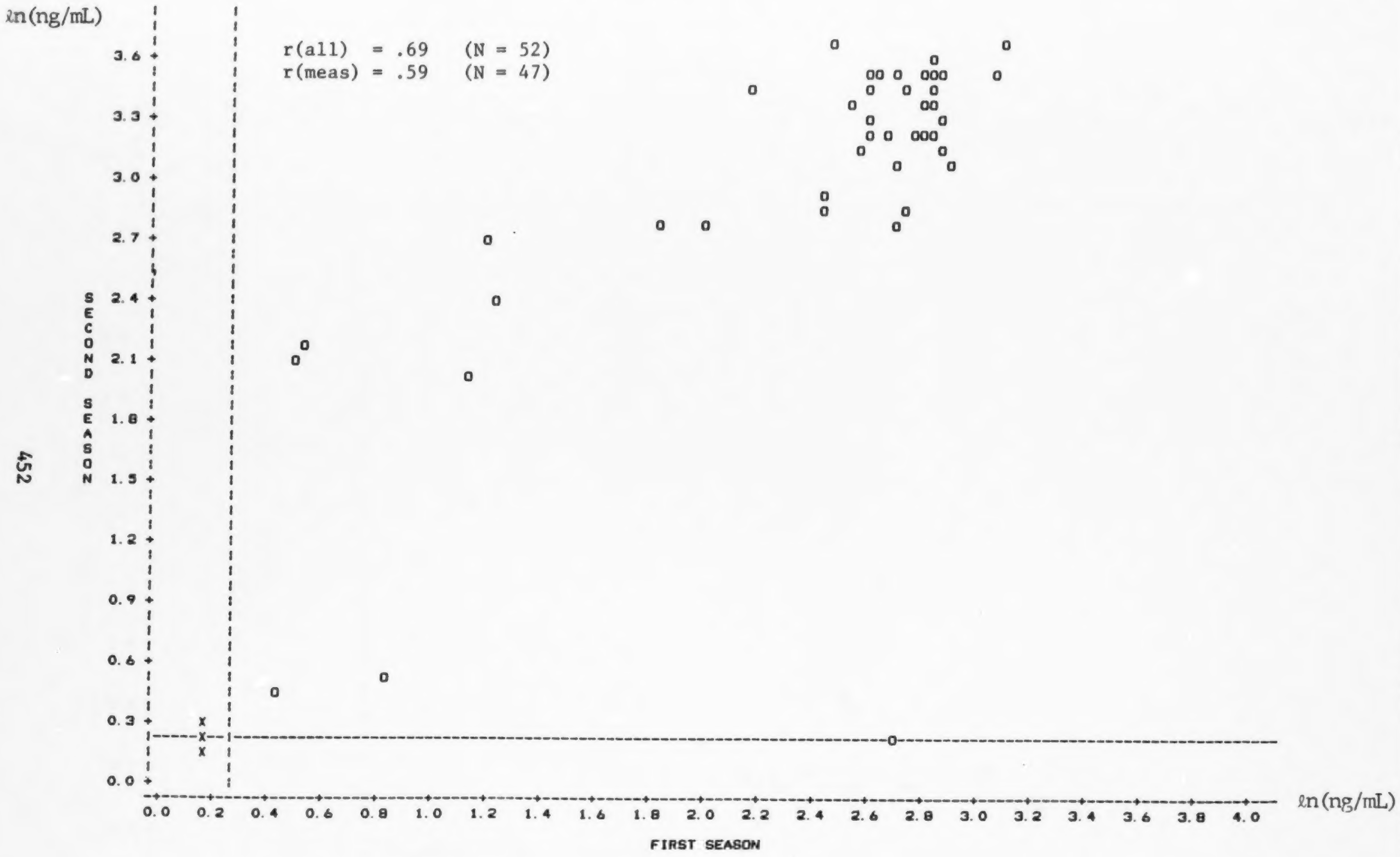

Figure 139. Bromodichloromethane for water - Los Angeles.

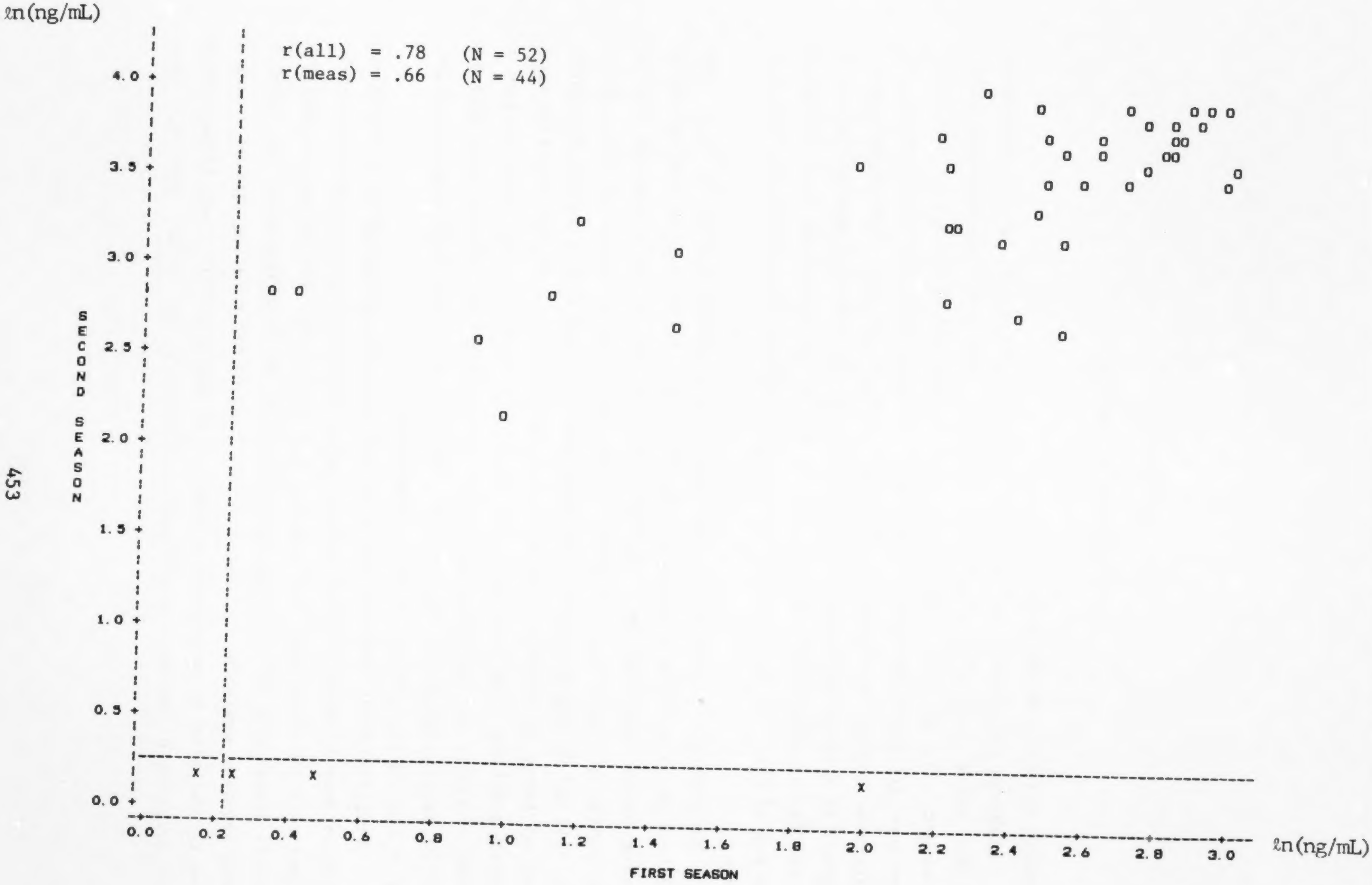

Figure 140. Dibromochloromethane for water - Los Angeles.

SECTION 9

COMPARISON OF RESULTS

CHEMICAL SAMPLING AND ANALYSIS

Although the details of implementing the sampling and analysis components of this study have been continually modified, the basic approach has been unchanged. The matrices sampled, as well as the overall sampling strategy, have been preserved through 9 independent sampling efforts. Furthermore, the analytical protocols employed, although refined through experience, were applied to samples collected in California as they were to samples collected in the first northern New Jersey trip. A few target compounds were changed at the end of Phase II (prior to California) to reflect the findings in previous trips.

Improvements in the details associated with sample collection (e.g. pump calibration to provide a constant sampled volume; minimizing of contamination during breath sampling) were incorporated continuously as recognized during the course of the study. These have been discussed in detail in this report and will not be repeated here. Besides providing for higher sample integrity, many of these refinements result in more efficient use of very precious time during sampling. The execution of a successful TEAM sampling trip requires a level of effort and technical commitment far greater than what would be apparent to the average reader of this report. The intent of the following paragraphs is to capture the essence of such a commitment.

Preparation of sampling materials and assembly of equipment for sampling must be done by an individual who has acute attention to the minutest detail. Experience on other sampling programs has shown that fastidious concern for detail avoids many difficulties upon arrival at the sampling site. All conceivably required equipment and materials to conduct the sampling must be transported to the site in an organized manner. In essence, this means transporting and erecting a surrogate analytical laboratory in the field. Equipment must be calibrated and its performance verified prior to departure. These functions can generally not be performed in the field because of the absence of the specialized equipment required.

Selection of suitable boarding and working facilities for the sampling staff must be made with a careful eye toward preserving sample integrity. Arrangements with hotel staff to achieve this requirement have often been laborious. In many cases, hotel staff have been less than accomodating after the sampling staff has arrived at the hotel. This has required extensive diplomatic negotiations to insure that the collection of samples not be interrupted. Without exception, rented facilities have never been damaged, despite the presence of gas cylinders, sampling pumps, auto batteries and numerous other sampling devices. Nevertheless, hotel housekeeping personnel have frequently been greatly intimidated by the volume and type of devices kept in the workroom and have refused to perform basic domestic services, inspite of assurances of safety by RTI and hotel management staff. Since the workroom was sometimes rented for a period of several months, these functions were often performed by RTI staff.

Manpower requirements for the various trips depended on the number of study participants. Because of the physical stress of eating at irregular hours (if at all) and working 15 hour days, 7 days a week, a given person was assigned to field activities for no longer than 20 days. However, in isolated cases, RTI staff were assigned to sampling trips for more than three weeks. This self-imposed time restriction generally necessitated that many staff be selected, trained, transported to the site and returned in order to complete the study. This is a very costly restriction but one which prevents the major sampling errors associated with exhausted sampling teams.

An average day for the sampling teams consists of the following activities. Morning appointments may be as early as 0430 but are more typically between 0630 and 0900. The sampling team needs to be in the workroom approximately 45 min prior to the first appointment to assemble the necessary equipment, fill the portable cooler with ice, review appropriate paperwork and travel to the location of the appointment. This is generally the period when rush hour traffic is on the roads. After completing the three morning appointments, a process requiring approximately 2 hr, the team must return to the workroom to store samples, charge sampling pumps and insure that the sampling protocol sheets are completed (approximately 1 hr). After breakfast, the team may perform one or more of the following functions: (1) preparation of sampling materials (including pump calibration); (2) exchanging of sampling protocol sheets with other teams to verify that all information is present and accurate; (3) inventoring and packaging of samples for return to the Institute; (4) communicating with staff at the Institute; (5) acquiring meteorological data from a local weather service office; (6) shopping for needed sampling equipment; (7) general housekeeping; (8) repairing of defective sampling equipment; (9) receiving incoming phone messages from the field interviewers; (10) confirming scheduled appointments with study respondents by telephone. Each of these activities must be performed by someone. This generally consumed all available time before the afternoon appointments. Afternoon and evening appointments will necessitate that the teams be on the road until approximately 2100. As for the morning appointments, this schedule again requires the team to be traveling during rush hour, making punctual arrival at the respondents residence extremely difficult if long travel distances are involved. In addition, early morning and evening appointments require that the team locate residences in the dark. This is extremely difficult in unfamiliar geographic areas. Convenient parking to facilitate the breath sampling was always difficult to find because of the metropolitan nature of the sampling sites. The same process of sample storage and document completion as occurred in the morning transpires after the evening appointments. After preparation for the following morning's appointments, the teams will have dinner. It is worthy of note that finding an open restaurant after 2130 has sometimes been difficult, particularly in remote areas. After dinner, additional paperwork may still be required of the site administrator.

This schedule, as laborious as it is, presumes that all intended activities proceed unimpeded. In fact, this rarely occurs. Difficulties with incorrectly made appointments or with respondent "no shows" has plaqued nearly every trip. Furthermore, respondents occasionally fail to keep their appointments for the second and third visits, forcing the sampling team to either wait for them or attempt to recontact them at a later time. Language barriers have frequently been troublesome to sampling teams. When the teams were alerted to these barriers prior to the first appointment, arrangements could be made for neighbors or relatives to serve as interpreters. This, however, was not always possible. Even where language barriers have not existed, sampling personnel have frequently found themselves functioning as study salesmen because the full burden of study participation was not explained by the field interviewers. Lastly, many respondents resided in high security apartment buildings, making personal contact difficult when the team arrived.

Ultimately, the enforcement of Standard Operating Procedures on sample collection and analysis resulted in minimizing subjectivity and consequently, errors. These SOPs were the product of extensive experience derived from earlier trips on this program, as well as numerous sampling efforts on other similar programs. This rigidity and uniformity in the collection and analysis procedures greatly increased the burden on, particularly, the sampling teams. In essence, implementation of an already complex sample collection scheme was made more difficult by the increased work load involved in strict adherence to the SOPs. However, the result of use of the SOPs was to maximize sample and data integrity by providing an detailed "expert" approach to collection and analysis.

QUALITY ASSURANCE

The comparison of the QA/QC results between Phase II and Phase III of the TEAM study showed a significant improvement in the California trips compared to the earlier northern New Jersey work. This observation covered nearly all aspects of the study and was, in large part, due to the issuance of Standard Operation Procedures as a guide for the analyst and sample collector.

Field Operation

Several problems developed during the early New Jersey sampling trips. Of these, contamination of Tenax and the numerous pump failures were the most serious. Most of these problems were resolved or minimized by implementing appropriate changes in operating protocols. The latter Phase III sampling trips were the benefactors of this learning experience.

Also contributing to the improved field operation was the accumulated sampling experience of the field staff and the resulting more efficient handling of routine sampling tasks. The 24 hour exposure screener questionnaire which caused some confusion in New Jersey underwent some minor modifications to give a form much easier to administer.

Completeness

In general, the completeness values for all sample types were above 90% and were constant over all sampling trips. One exception was the third New Jersey trip where the completeness was 80-94%. The duplicate completeness values tended to be lower than for the field samples.

Precision

The analytical precision associated with Tenax sample duplicates collected during Phase II (New Jersey) was quite variable. Agreement between duplicates collected at the first and third trip New Jersey and Greensboro was satisfactory. Comparable data from duplicate Tenax samples collected on second season New Jersey and North Dakota sampling trips exhibited much poorer precision. The major reason for this was the use of Tenax containing large and variable background levels of target compounds.

After this experience of cartridge contamination, the cleanup of recycled Tenax was monitored very closely. Consequently, the precision of the duplicate sample analysis of California collections was approximately equivalent to the best (New Jersey) Phase II data. The Tenax contamination noted in second season New Jersey and North Dakota was not observed in the California air and breath samples.

Analytical precision of water duplicate results was excellent for all sampling trips.

Accuracy

Analytical accuracy was based on the results obtained on performance audit samples. The Tenax cartridges were spiked with selected target compounds by EMSL/EPA at RTP.

No particular trend in the results was apparent. Analytical bias of less than 30-35% was considered satisfactory, and this range represented the majority of the audit results. Exceptions were the data obtained during the sample analysis for second season New Jersey and North Dakota where Tenax of questionable quantity was used.

During the course of the TEAM study, the mechanism for camouflaging the identity of the audit samples was refined. In the early New Jersey work, attempts at passing off the audit samples as field samples was often not successful. During the Phase III analysis, we had become so expert at creating a forged sample code and chain-of-custody sheet, that the blind nature of the analysis was probably realized.

Tenax Sample Storage

There was some concern about the storage time of Tenax cartridges between sample collection and analysis. To maintain sample integrity, a limit of 30 days, was considered to be maximum.

Tenax samples from the first two New Jersey trips were held a maximum of 3.5 months before analysis. The samples from the second New Jersey trip were stored one month before the analysis was even begun. On the other hand, all Tenax samples from the second California trip (Los Angeles and Contra Costa county) were analyzed within one month of collection. Tenax samples from the first California trip were analyzed 3 to 8 weeks after collection.

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2. Chromy, James, R. Sequential Sample Selection Methods. Section on Survey Research Methods of the American Statistical Association, pp. 401-406 (1979).
3. Shah, B. V. RTIFREQS: Program to Compute Weighted Frequencies, Percentages and Their Standard Errors. Research Triangle Institute, Research Triangle Park, NC (1982).
4. Holt, M. M. SURREGR: Standard Errors of Regression Coefficients from Sample Survey Data, Research Triangle Institute, Research Triangle Park, NC (1977).
5. Woodruff, Ralph S. Simple Method for Approximating Variance of a Complicated Estimate. Journal of the American Statistical Association, 66:411-414 (1971).
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Appendices

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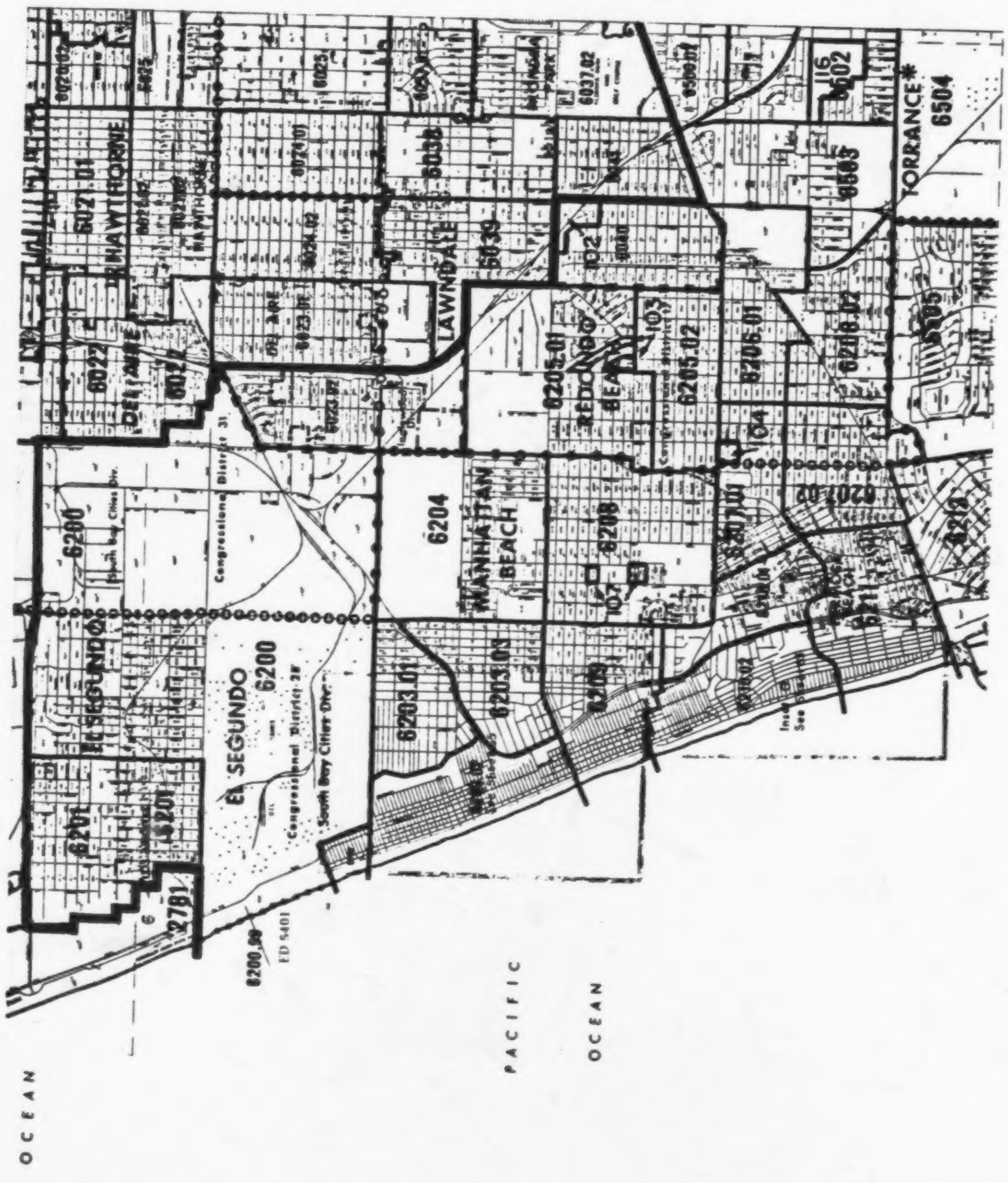
APPENDIX A

MAPS SHOWING THE LOCATIONS OF THE LOS ANGELES SAMPLE SEGMENTS

MAPS SHOWING THE LOCATIONS OF LOS ANGELES SAMPLE SEGMENTS

The locations of the Los Angeles sample segments are shown on the maps in this appendix. The sample segments are outlined in heavy black lines and marked with their sample segment numbers from 101 to 125 inclusive. The target area is shown on the maps by shading the portion of each map that lies outside the target area.



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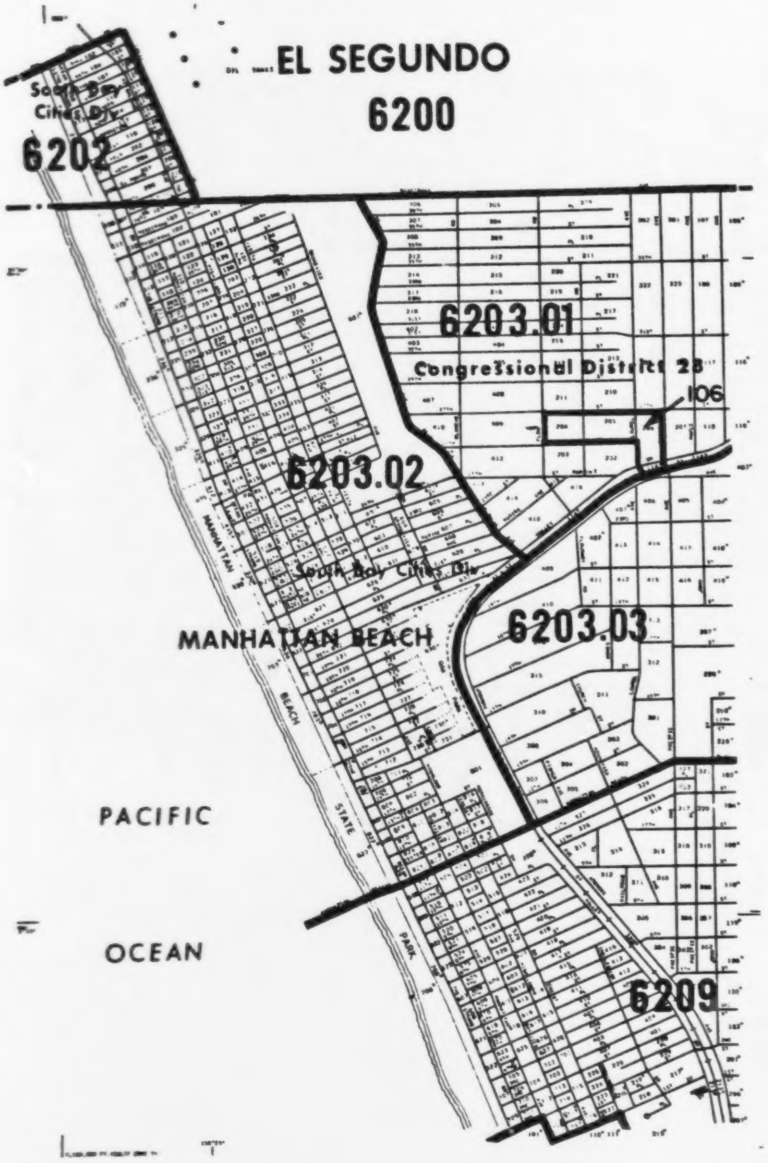
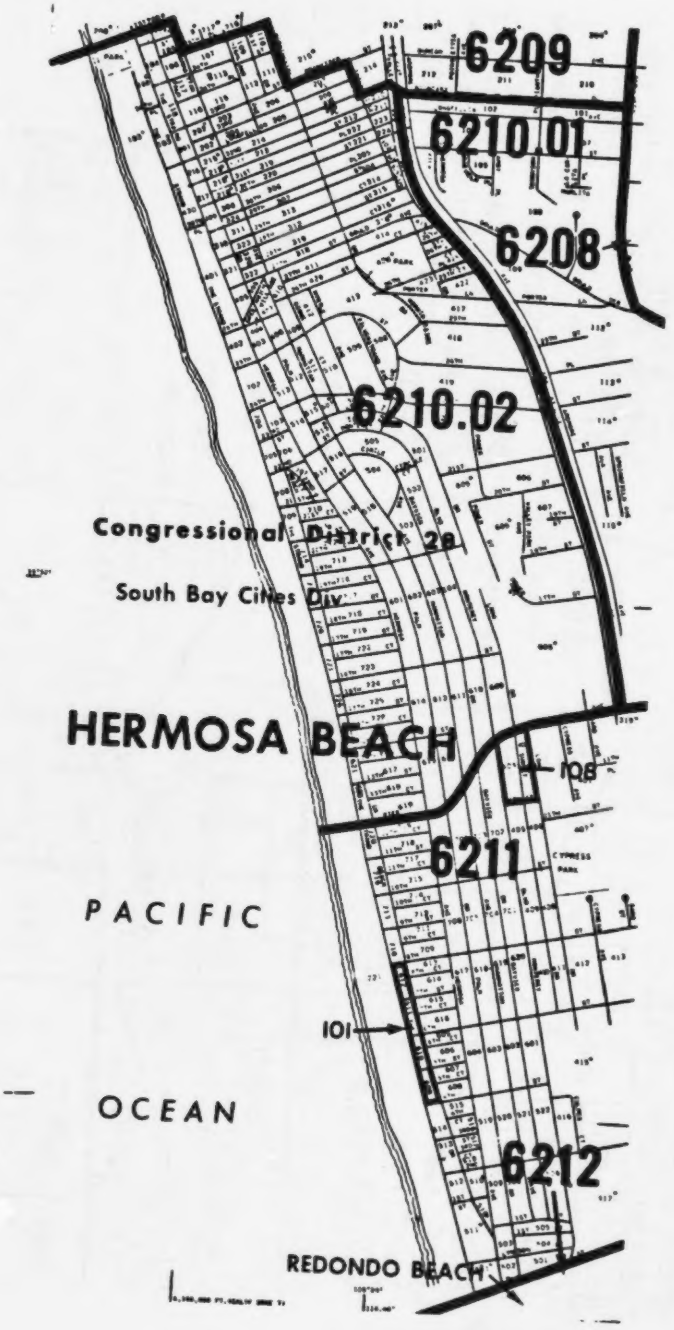

EL SEGUNDO
6200
South Bay Cities Div.
6202
6203.01
Congressional District 28
106
6203.02
South Bay Cities Div.
MANHATTAN BEACH
6203.03
MANHATTAN BEACH STATE PARK
PACIFIC
OCEAN
6209



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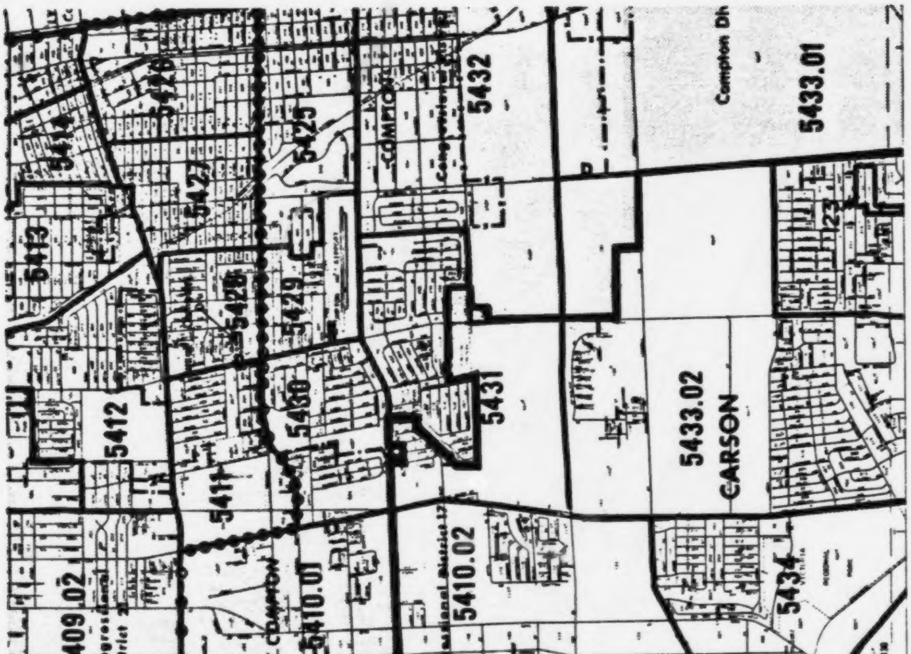
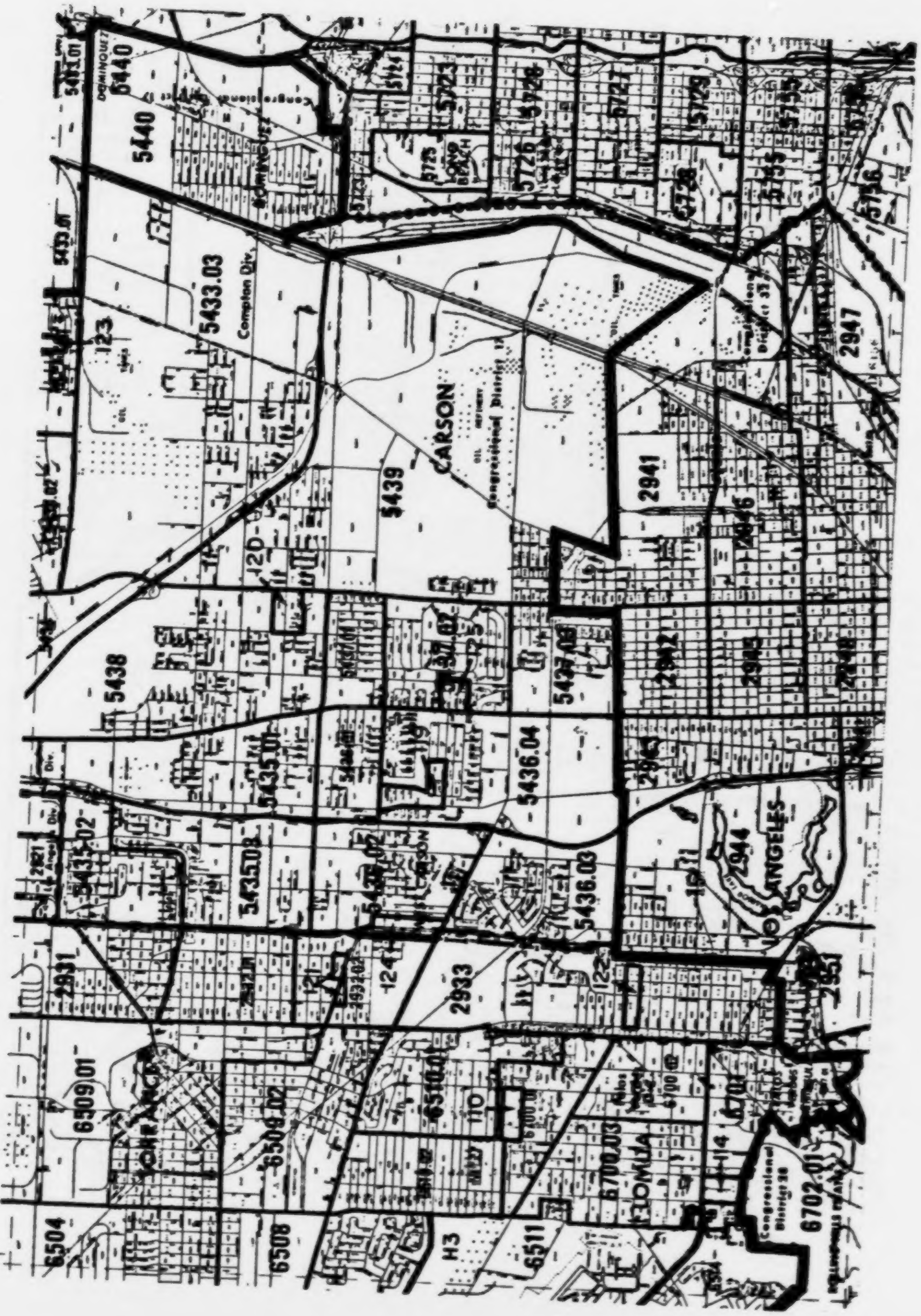

5413
5414
5428
5427
5426
5425
COMPTON
5432
Compton Div.
5433.01
5429
5412
5430
5431
5433.02
CARSON
5411
5409.02
Congressional District 31
5410.01
WEST COMPTON
Congressional District 32
5410.02
5434
2911
2912
2913
2921
Compton Div.
Los Angeles Div.
WEST ATHENS
6029
6030.01
6031
6030.02
GARDEN
6033
6032
LOS ANGELES
2931
Inglewood Div.
6034
6026
6500.01
6501.01
TORRANCE
6502
6509.01
Torrance Div.
6037.01
ALONDRA PARK
6037.02
6500.02
6501.02
6504



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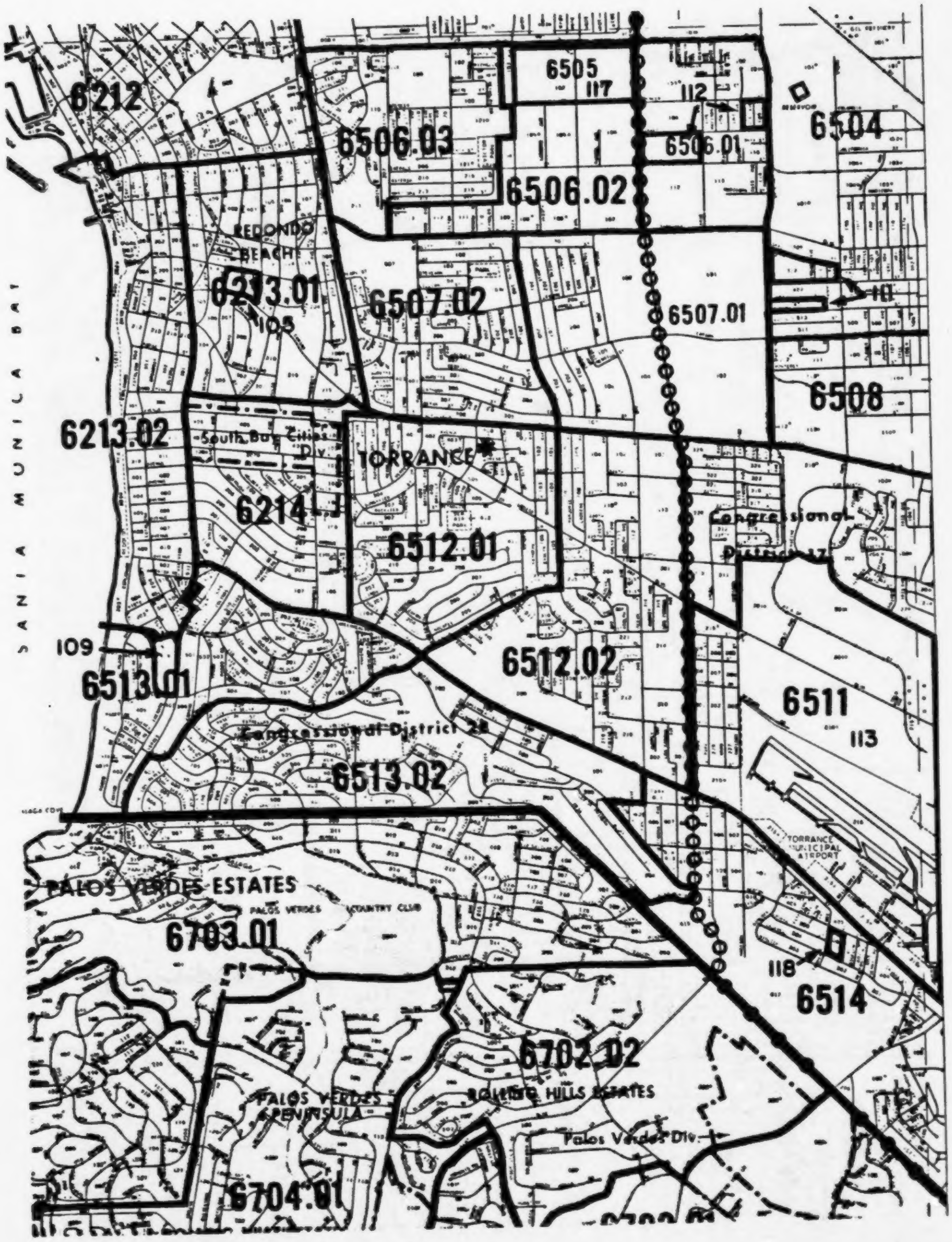
6212
6505
117
112
6504
6506.03
6506.01
6506.02
REDONDO BEACH
6213.01
105
6507.02
6507.01
110
6508
6213.02
South Bay Cities Div.
TORRANCE
6214
6512.01
Congressional District 17
SANTA MONICA BAY
109
6513.01
6512.02
6511
113
Congressional District 28
6513.02
PALOS VERDES ESTATES
PALOS VERDES
COUNTRY CLUB
6703.01
TORRANCE MUNICIPAL AIRPORT
118
6514
6702.02
PALOS VERDES PENINSULA
ROLLING HILLS ESTATES
Palos Verdes Div.
6704.01

APPENDIX B

MAPS SHOWING THE LOCATIONS OF THE ANTIOCH/PITTSBURG SAMPLE SEGMENTS

MAPS SHOWING THE LOCATIONS OF THE ANTIOCH/PITTSBURG SAMPLE SEGMENTS

The locations of the Antioch/Pittsburg sample segments are shown on the maps in this appendix. The sample segments are outlined in heavy black lines and marked with their segment numbers from 201 to 210. The target area is also outlined on the maps by heavy black lines.

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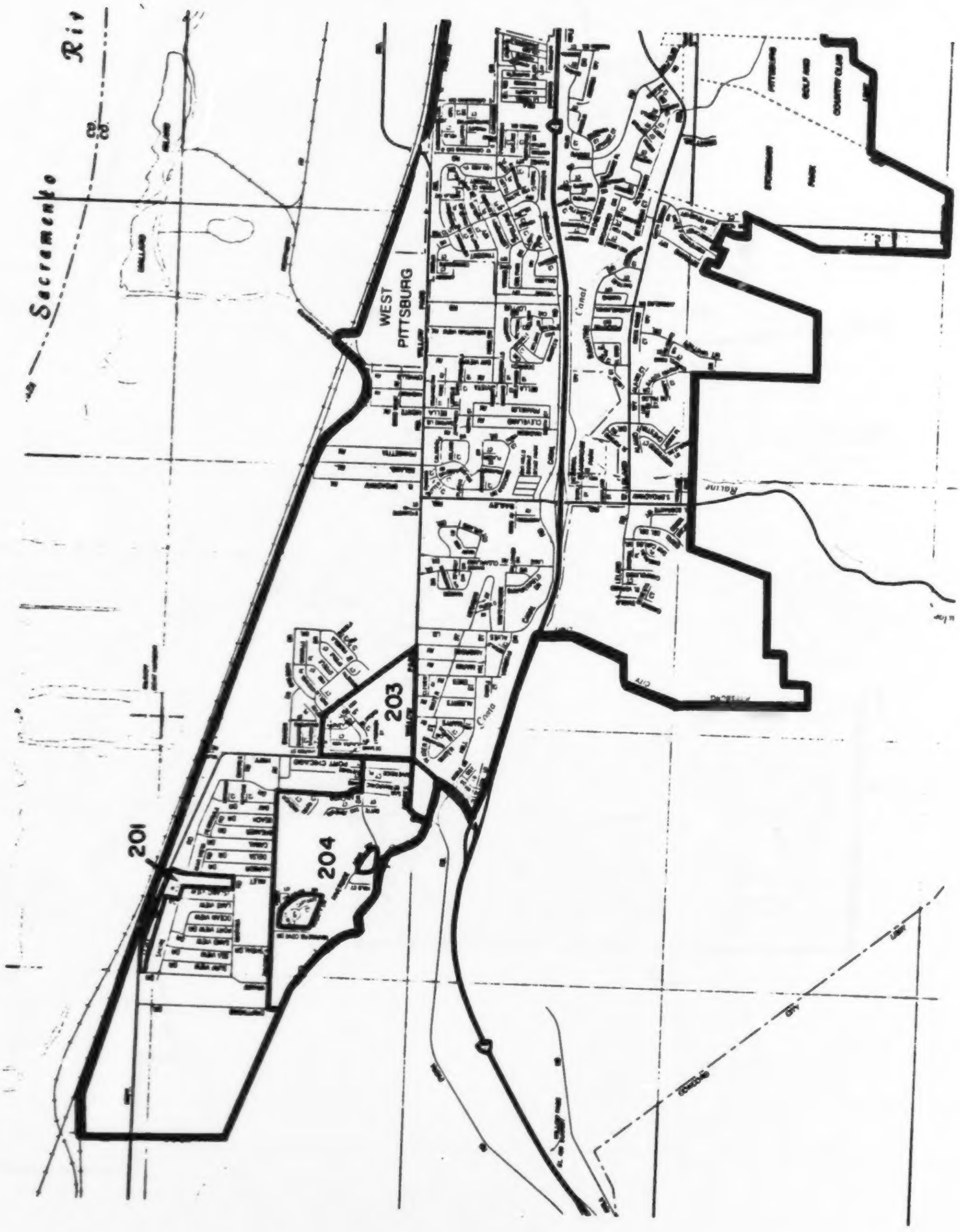
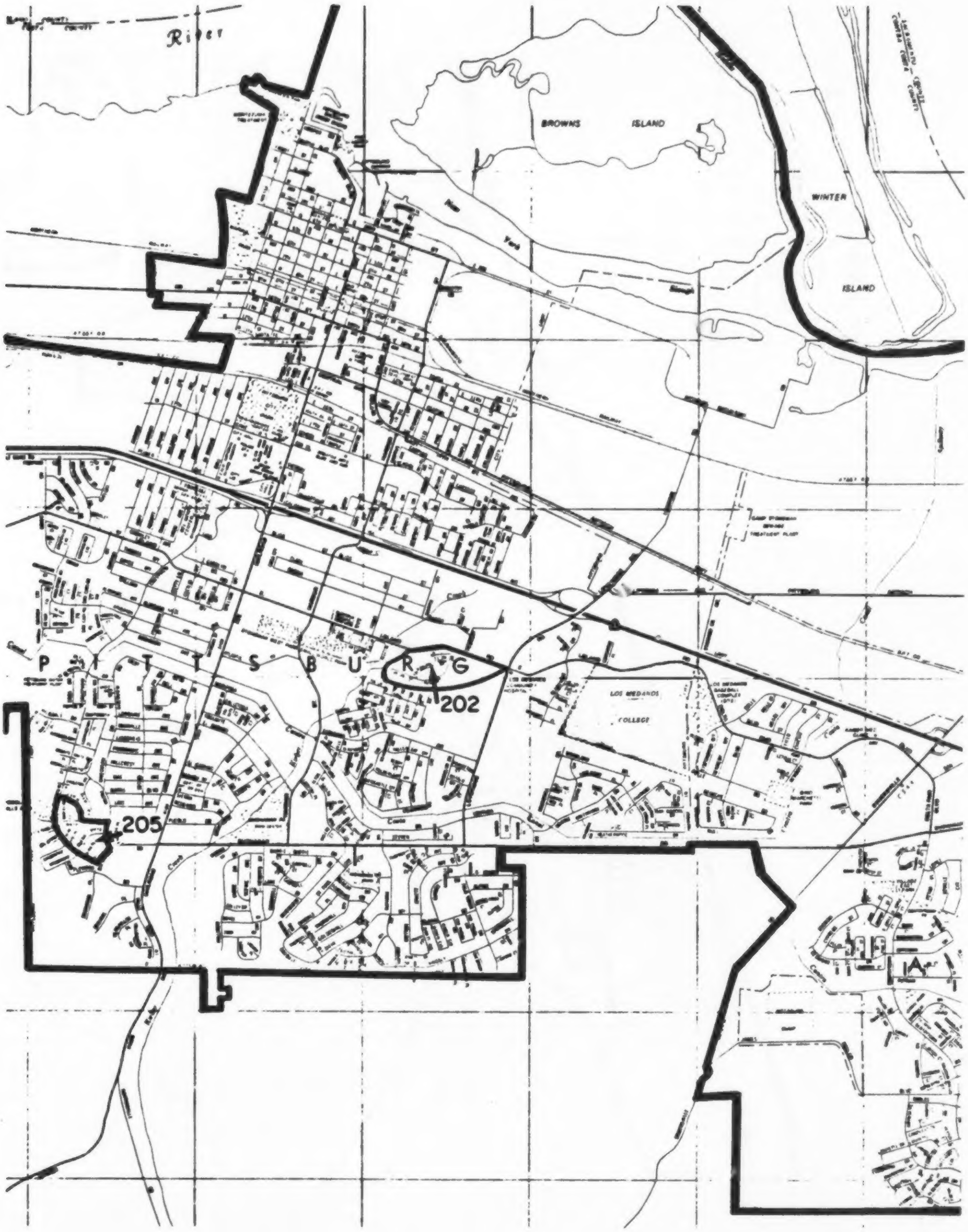
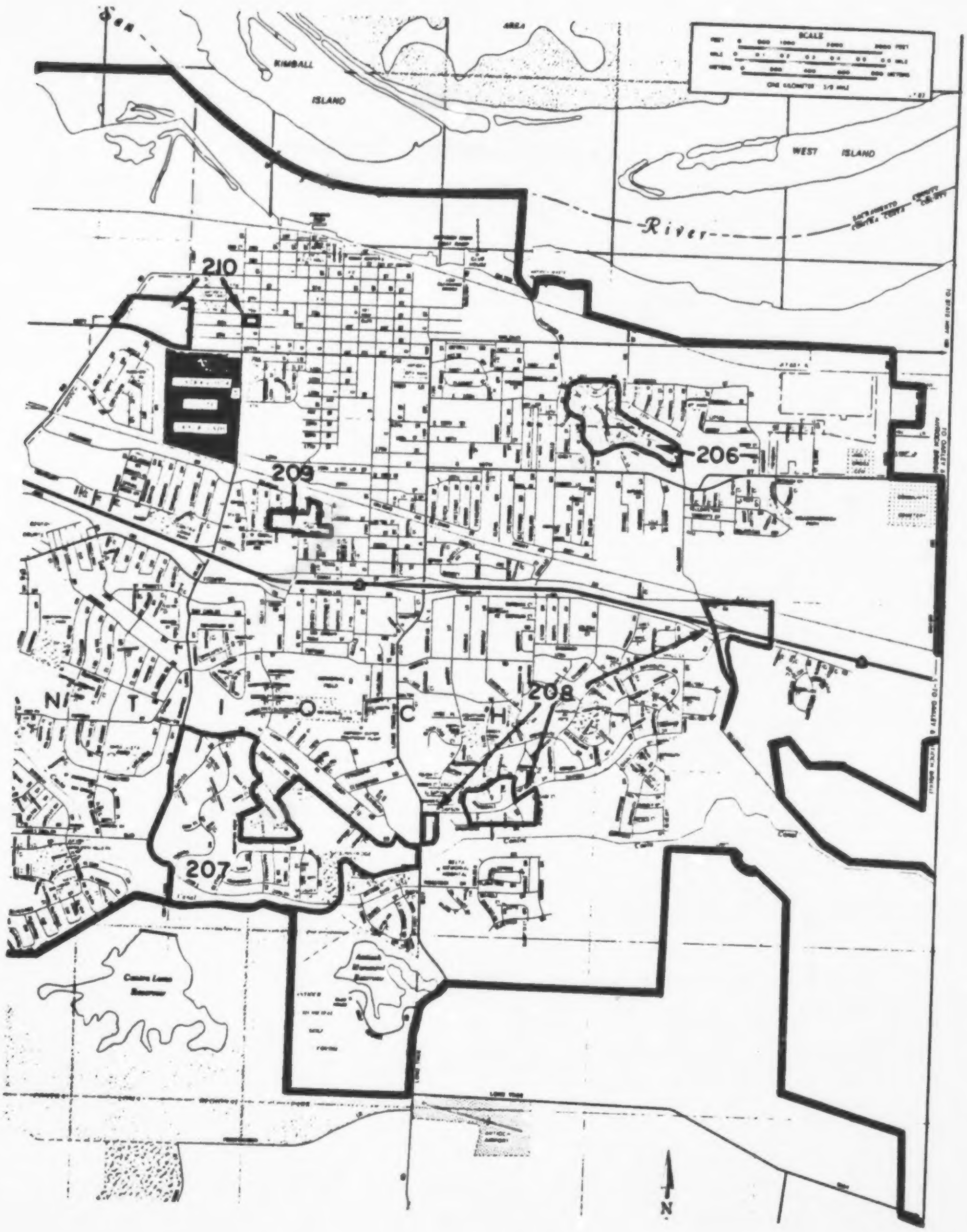



River
BROWNS ISLAND
WINTER
ISLAND
P I T T S B U R G
202
205
LOS MEDANOS
COLLEGE
A

Reproduced from
best available copy.



APPENDIX C

DATA COLLECTION INSTRUMENTS

11/83

FOR OFFICE USE ONLY

HOUSEHOLD SCREENING QUESTIONNAIRE
TEAM Study
RTI Project 2392

A. HOUSEHOLD IDENTIFICATION

Segment No. ☐☐☐

SHU No. ☐☐☐

STREET ADDRESS

City State ZIP

TELEPHONE NUMBER
Obtained → ☐☐☐ - ☐☐☐☐
NO PHONE . . 00
REFUSED. . . 01

B. RECORD OF SCREENING CALLS

Day of Week	Date	Time	Results	Code	FI ID No.
		am pm			
		am pm			
		am pm			
		am pm			
		am pm			
		am pm			
		am pm			
		am pm			
		am pm			

C. FINAL SCREENING RESULT

(CIRCLE ONE.)

SAMPLE DROP:
- Vacant 01
- Not an HU. 02
- Temporary/vacation home. 03

} SECTION D.

SCREENING NOT COMPLETED:
- Refusal. 04
- No one at home (after repeated visits). 05
- No eligible respondent (after repeated visits). 06
- Language barrier 07
- Other (SPECIFY). 08

} HOLD FOR APPROVAL BY FS.

SCREENING COMPLETED: 09

D. INFORMANT IDENTIFICATION

NAME:

ADDRESS:

CITY: STATE: ZIP:

RELATIONSHIP/TITLE:

TELEPHONE NUMBER:
No phone. . . . 00
Refused 01

COMMENTS:

FOR FS USE ONLY

FS approval:

Verified?
Yes 01
No 02

Date of verification:

NOTES:

E. HOUSEHOLD ROSTER

Hello, I'm (NAME) from the Research Triangle Institute. We are conducting a research study for the Environmental Protection Agency. Here is a letter that explains the study. (HAND LETTER AND ALLOW TIME FOR READING.)

1. To start, how many people (including friends or roomers) live in this household? ☐☐ HOUSEHOLD MEMBERS
2. What is the name of the head of this household? ENTER NAME ON FIRST LINE OF ROSTER.
3. What are the names of all other persons related to (HEAD OF HOUSEHOLD) who live here? Let's list them in order of age, beginning with the oldest. ENTER NAME(S) IN ROSTER.
4. Are there any other persons who currently live here? IF YES, ENTER NAME(S) IN ROSTER.

CHECKPOINT	DOES NUMBER OF NAMES LISTED IN ROSTER EQUAL NUMBER OF HOUSEHOLD MEMBERS RECORDED IN Q. 1? YES . . . . . 01 GO TO QUESTION 5. NO. . . . . . 02 RECONCILE DISCREPANCY WITH RESPONDENT AND CORRECT Q.1 OR ROSTER AS NECESSARY.

ASK Qs. 5 AND 6 FOR EACH PERSON LISTED IN ROSTER.

5. (IF NECESSARY:) Is (PERSON) male or female? CODE IN ROSTER - COLUMN b.
6. How old was (PERSON) on [HIS/HER] last birthday? ENTER IN ROSTER - COLUMN c.

ASK Q.7 ONLY FOR PERSONS 10 YEARS OF AGE OR OLDER.

7. Does (PERSON) smoke cigarettes or other material on a regular basis? CODE IN ROSTER - COLUMN d.

HOUSEHOLD ROSTER

	a Member Name First Last	b Sex (M or F)	c Age (Years)	d Smoker (Y/N)	e Occupational Status	f Name of Employer	g Nature of Job
01		M F		Y N			
02		M F		Y N			
03		M F		Y N			
04		M F		Y N			
05		M F		Y N			
06		M F		Y N			
07		M F		Y N			
08		M F		Y N			
09		M F		Y N			
10		M F		Y N			

ASK Qs. 8, 9, AND 10 (AS APPROPRIATE) FOR EACH PERSON WHO IS 16 OR OLDER. ASK ABOUT ONE PERSON AT A TIME.

8. What is the line number from this list [HAND RESPONDENT 'OCCUPATIONAL STATUS SHOW CARD'] which best describes (PERSON)'s current occupational status? RECORD IN COLUMN e.

FOR EACH PERSON 16 YEARS OF AGE OR OLDER WHO HAS A STATUS IN COLUMN e OTHER THAN 20, 21, 22 OR 23, ASK Qs. 10 AND 11, AND RECORD RESPONSES IN COLUMNS f and g.

9. What is the name of the company where (PERSON) works?
10. What type of job does (PERSON) currently hold?

11. In case my supervisor wants to verify my work, what is the telephone number here? RECORD IN SECTION A.

CHECKPOINT	ENTER LINE NUMBER OF SCREENING RESPONDENT ☐

CONCLUDE INTERVIEW BY THANKING RESPONDENT.

Research Triangle Institute

PARTICIPANT CONSENT FORM AND INCENTIVE RECEIPT

I understand that the Research Triangle Institute, under contract from the U.S. Environmental Protection Agency (EPA), is engaged in a study of the potential exposure and absorption of certain toxic chemicals by residents of selected areas of California having various levels of these toxic chemical compounds in the environment. I understand that the study is being conducted in order to help measure the levels of exposure and body uptake of the selected toxic compounds in populations environmentally exposed, and is limited to the purpose stated. I further understand that the survey is being conducted in cooperation with the California Department of Health, the Contra Costa Health Department, and the Bay Area and South Coast Basin Air Quality Management Districts.

I do hereby freely consent to participate in this study of potential exposure and absorption of selected toxic chemical compounds and understand that my participation will consist of providing answers to questions related to environmental exposure, working and living conditions, and basic demographics, and supplying some or all of the following environmental and biological samples: (1) two four-ounce samples of cold tap water from a source commonly used for drinking and cooking, (2) a breath sample, (3) samples of air from the house and work environments, collected through the use of a personal air monitor, and (4) an outdoor air sample collected through the use of a similar air monitor. I understand that an agent of the Research Triangle Institute will administer the questionnaire in my home, and at the same time will make arrangements for the collection of the environmental and biological samples. I understand I will receive an incentive of fifteen dollars for my full participation in the study. I understand that a few households will be selected for the collection of duplicate samples (to be collected at the same time as the original samples) but that such selection would not entitle me to further compensation. I further understand that a sample of the participating households may be contacted again during a different season of the year. At that time they will be asked to repeat all the activities of the first round, and will receive a second incentive payment.

I understand that my name will not be voluntarily disclosed, and that my name will not be referred to in any way when compiling and evaluating the results of the study. I understand that participation in this study may result in no direct benefit to me, other than the results of my sample analyses which I will receive after written request. Although my request for data will be acknowledged immediately, the processing and analysis of the data will delay the release of the data for as much as a full year. I further understand that I am free to withdraw from this study at any time, and that during my participation in the study I will be free to ask any questions concerning the study. If I have any further questions about the project, I know that I am free to contact the EPA Region 9 Public Affairs Office, telephone number (415) 974-7651 or Mr. Harvey S. Zelon, Center for Survey Research, Research Triangle Institute, Research Triangle Park, North Carolina 27709, telephone number (800) 334-8571 (toll-free).

Date: ☐☐ - ☐☐ - ☐☐ Participant's Name: ____________________
(Month) (Day) (Year) (Print)

Signatures:

Participant: ____________________ Interviewer: ____________________

PID Number

Interviewer Number: ☐☐☐☐☐☐

I hereby acknowledge receipt of fifteen dollars ($15.00) from the Research Triangle Institute for my participation in this study.

PID Number: ____________________

____
Participant's Signature

Date: ____________________

____
RTI Representative

OMB Approval No. 2000-0364
Expiration Date 9/30/86

STUDY ON TOXIC CHEMICALS IN ENVIRONMENTAL AND HUMAN SAMPLES

Conducted by:
Research Triangle Institute
P.O. Box 12194
Research Triangle Park, North Carolina 27709

QUESTIONNAIRE

THE RESEARCH TRIANGLE INSTITUTE OF RESEARCH TRIANGLE PARK, NORTH CAROLINA, IS UNDERTAKING A RESEARCH STUDY FOR THE U.S. ENVIRONMENTAL PROTECTION AGENCY TO ASSESS LEVELS AND RELATIONSHIPS OF SELECTED TOXIC COMPOUNDS IN MAN AND ENVIRONMENTAL MEDIA. THE INFORMATION RECORDED IN THIS QUESTIONNAIRE WILL BE HELD IN STRICT CONFIDENCE AND WILL BE USED SOLELY FOR RESEARCH INTO THE EFFECTS OF ENVIRONMENTAL FACTORS ON PUBLIC HEALTH. ALL RESULTS WILL BE SUMMARIZED FOR GROUPS OF PEOPLE; NO INFORMTION ABOUT INDIVIDUAL PERSONS WILL BE RELEASED WITHOUT THE CONSENT OF THE INDIVIDUAL. WHILE YOU ARE NOT REQUIRED TO RESPOND, YOUR COOPERATION IS NEEDED TO MAKE THE RESULTS OF THIS SURVEY COMPREHENSIVE, ACCURATE AND TIMELY.

(PLACE PID LABEL HERE)

(PLACE CHEMISTRY LABEL HERE)

First, I would like to ask some general questions about you.

1. Sex ***(by observation)*****:**

☐ 1 Male　　☐ 2 Female

2. Race ***(by observation)*****:**

☐ 1 Hispanic	☐ 4 Asian/Pacific Islander
☐ 2 American Indian/Alaskan Native	☐ 5 White, not of Hispanic origin
☐ 3 Black, not of Hispanic origin	☐ 6 Other *(specify)* ________________

3. What was your age in years at last birthday? ☐☐ Years

4. What is your birthdate? ☐☐ – ☐☐ – ☐☐
(month) *(day)* *(year)*

5. What is your approximate weight in pounds? ☐☐☐ lb　☐ 1 Do not know

6. What is your approximate height in feet and inches? ☐☐ ft　☐☐ in

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Next, I would like to ask some questions about your occupation.

7. Are you presently employed in any capacity?

☐ 1 Yes *(CONTINUE)*　　☐ 2 No *(GO TO QUESTION 11)*

8. a. What is your current occupation?

____

b. Is this your usual primary occupation?

☐ 1 Yes *(GO TO QUESTION 9)*　　☐ 2 No *(GO TO QUESTION 8c)*

c. What is your primary occupation?

____

9. How long have you been employed in that occupation?

☐☐　☐ 1 Months　☐ 2 Years

10. What is the name and street address of the company for which you work?

Name: ____

Address: ________________________________ ☐☐☐☐☐
(zip code)

(GO TO QUESTION 12)

11. If not presently employed, which of the following best describes your status?

☐ 1 Housewife
☐ 2 Student
(GO TO QUESTION 12)

☐ 3 Unemployed
☐ 4 Retired
☐ 5 Disabled
(GO TO QUESTION 11a)

11. a. What was your main occupation?

____

12. Indicate whether you or any members of your household are employed in any of the listed occupations or establishments.

Occupation	You	Household Members
Painting	☐	☐
Dry cleaning	☐	☐
Chemical plant	☐	☐
Petroleum plant	☐	☐
Service station/garage/engine repair	☐	☐
Furniture repair/refinishing	☐	☐
Plastics manufacture or formulation	☐	☐
Textile mill	☐	☐
Wood processing plant	☐	☐
Printing	☐	☐
Scientific laboratory	☐	☐
Dye plant	☐	☐
Hospital	☐	☐
Metal products (casting)	☐	☐
Battery or electrical components manufacture	☐	☐
Refrigerator/air conditioning repair or manufacture	☐	☐
Taxi/bus/truck driver	☐	☐
Pest control	☐	☐
Drug manufacturing or formulation	☐	☐
Photo developing	☐	☐
Landscaping/gardening	☐	☐
None of the above	☐	☐

Next, I would like to ask some questions regarding your personal habits.

13. Which of the following best describes your cigarette smoking status?

1 Current smoker *(GO TO QUESTION 16)*

2 Ex-smoker *(CONTINUE WITH QUESTION 14)*

3 Never smoked *(GO TO QUESTION 17)*

14. For how many years did you smoke at least ½ pack of cigarettes per day?

☐☐ Years

15. How long ago did you quit smoking?

☐☐ 1 Days 2 Weeks 3 Months 4 Years

16. a. On average, how many cigarettes do/did you smoke per day?

1 Less than ½ pack

2 Between ½ and 1½ packs

3 More than 1½ packs

16. b. What brand of cigarettes do/did you usually smoke?

____

17. Does anyone else in your household smoke cigarettes?

1 Yes	2 No

18. Do you or anyone else in your household smoke cigars or pipes?

You	Anyone Else
1 Yes: How many per day? __________	1 Yes: How many per day? __________
2 No	2 No

19. On average, how many hours are you in the same room, or enclosed area, with someone who is smoking? Respond for time at home, and time at work.

At Home	At Work
1 0	1 0
2 1 to 5	2 1 to 5
3 6 to 10	3 6 to 10
4 More than 10	4 More than 10

20. Do you or any member of your household pursue any of the following hobbies? *(CHECK ALL THAT APPLY.)*

Occupation	You	Household Member
Painting	☐	☐
Furniture refinishing	☐	☐
Scale models	☐	☐
Gardening	☐	☐
None of these	☐	☐

21. Do you work with or use insecticides, pesticides, or herbicides, as in farming, gardening, or extermination?

1 Yes *(GO TO QUESTION 21a)*	2 No *(GO TO QUESTION 21b)*

a. How often would you say that you work with or use such substances?

1 Rarely	3 Often
2 Occasionally	

b. How often do you have your house treated for pests?

1 Never	3 Quarterly
2 Monthly	4 Yearly

Next, I would like to ask some questions regarding your general physical status.

22. What do you consider your current physical condition? *(CHECK ONE.)*

1 Excellent	3 Fair
2 Good	4 Poor

23. Are you currently taking any prescription medication(s) on a regular daily basis?

1 Yes	2 No

IF YES, SPECIFY: ____________________

24. Have you taken any nonprescription medications (aspirin, vitamins, etc.) in the past 48 hours?

1 Yes	2 No

IF YES, SPECIFY: ____________________

25. Which of the following conditions have you ever been treated for?

1 Anemia	4 Chronic respiratory disease
2 Liver disease	5 None of these
3 Kidney disease	

26. How would you rate your general recreational/exercise activity pattern?

1 Heavy	3 Sedentary
2 Light	

27. How would you rate your activity on the job?

1 Heavy physical activity	3 Sedentary
2 Light physical activity	4 Not applicable (Retired, unemployed, or disabled)

Next, I would like to ask a question regarding your diet.

28. On the average, how often do you eat the following foods? *(CHECK ALL THAT APPLY.)*

Foodstuff	Daily*	More than 3 times per week	Less than 3 times per week	Once per week	Once per month	Infrequently or never
Beef	______	☐	☐	☐	☐	☐
Fish	______	☐	☐	☐	☐	☐
Pork	______	☐	☐	☐	☐	☐
Poultry	______	☐	☐	☐	☐	☐
Fresh fruit	______	☐	☐	☐	☐	☐
Frozen fruit	______	☐	☐	☐	☐	☐
Canned fruit	______	☐	☐	☐	☐	☐
Fresh vegetables	______	☐	☐	☐	☐	☐
Frozen vegetables	______	☐	☐	☐	☐	☐
Canned vegetables	______	☐	☐	☐	☐	☐
Eggs	______	☐	☐	☐	☐	☐
Cereals, rice, breads	______	☐	☐	☐	☐	☐
Cheese	______	☐	☐	☐	☐	☐

*Indicate number of servings per day.

(continued)

Foodstuff	Daily*	More than 3 times per week	Less than 3 times per week	Once per week	Once per month	Infrequently or never
Cola soft drinks	______	☐	☐	☐	☐	☐
Noncola soft drinks	______	☐	☐	☐	☐	☐
Canned juices	______	☐	☐	☐	☐	☐
Milk	______	☐	☐	☐	☐	☐
Beer	______	☐	☐	☐	☐	☐
Wine	______	☐	☐	☐	☐	☐
Coffee, tea (cooked water)	______	☐	☐	☐	☐	☐
Tap water and tap water drinks	______	☐	☐	☐	☐	☐

*Indicate number of servings per day.

Lastly, I would like to ask some questions about your residence and household.

29. How many years have you lived in this city?

☐☐ Years

30. Do you cool your home with any of the following appliances? *(CHECK ALL THAT APPLY.)*

1 Central air conditioning
2 Window air conditioner(s)
3 Portable circulating fan(s)
4 Ceiling exhaust fan(s)
5 None of these

31. Do you have any of the following appliances? *(CHECK ALL THAT APPLY.)*

1 Gas stove
2 Electric oven
3 Gas furnace
4 Oil heat

32. Does your household grow any of its own food in a home garden?

1 Yes
2 No
3 Do not know

IF YES, SPECIFY LOCATION OF GARDEN: ______________________________

33. Where does your household generally obtain its foodstuffs (groceries, fruit, vegetables, etc.) Specify name of the store or fruit or vegetable stand.

____

____

34. Do you use municipally supplied water for drinking and drink mixes (coffee, tea, Kool-Aid®, etc.)?

1 Yes
2 No } *(GO TO QUESTION 34a)*
3 No municipal supply } *(GO TO QUESTION 34a)*

a. **What source of water do you use?**

____

INTERVIEWER INFORMATION

Interviewer Number: ☐☐☐

Date of Interview: ☐☐ – ☐☐ – ☐☐
(month) *(day)* *(year)*

COMMENTS

Study Number: ____________________

Date: _____/_____/_____

24-HOUR EXPOSURE AND ACTIVITY SCREENER
TEAM Study

O.M.B. No. 2000-0364
Expires 9/30/86

1. **Have you pumped your own gas in the past 24 hours?**

   ☐ 1 Yes *(GO TO QUESTION 1a)* ☐ 2 No *(GO TO QUESTION 2)*

   a. **During which monitoring periods?**

   ☐ 1 Overnight ☐ 2 Daytime

2. **Have you done your own dry cleaning, or been in a dry cleaning establishment during the past 24 hours?**

   ☐ 1 Yes *(GO TO QUESTION 2a)* ☐ 2 No *(GO TO QUESTION 3)*

   a. **During which monitoring periods?**

   ☐ 1 Overnight ☐ 2 Daytime

3. **Have you smoked cigarettes, cigars, or a pipe in the past 24 hours?**

   ☐ 1 Yes *(GO TO QUESTION 3a)* ☐ 2 No *(GO TO QUESTION 4)*

   a. **During which monitoring periods?**

   ☐ 1 Overnight ☐ 2 Daytime

4. **Were you in an enclosed area with active smokers for more than 15 minutes at any time in the past 24 hours?**

   ☐ 1 Yes *(GO TO QUESTION 4a)* ☐ 2 No *(GO TO QUESTION 5)*

   a. **During which monitoring periods?**

   ☐ 1 Overnight ☐ 2 Daytime

5. **Have you used or worked with insecticides, pesticides, or herbicides in any way, including farming, gardening, and extermination, in the past 24 hours?**

   ☐ 1 Yes ☐ 2 No

6. **During this time of year, on an average weekday or weekend day, how many hours per day are spent:**
   (Answer a through d below)

	Weekday	Weekend Day
a. Away from home	☐☐	☐☐
b. Out of doors—leisure activities	☐☐	☐☐
c. Out of doors—working	☐☐	☐☐
d. In a motor vehicle	☐☐	☐☐

7. **Have you worked at any of the following occupations or been in any of the following businesses during the past week?** *(Check all that apply and also indicate any contact in the past 24 hours.)*

	Past Week	Past 24 Hours
☐ Painting	01	02
☐ Dry cleaning	03	04
☐ Chemical plant	05	06
☐ Petroleum plant	07	08
☐ Service station/garage/engine repair	09	10
☐ Furniture refinishing or repair	11	12
☐ Plastics manufacture or formulation	13	14
☐ Textile mill	15	16
☐ Wood processing plant	17	18
☐ Printing	19	20
☐ Scientific laboratory	21	22
☐ Dye plant	23	24
☐ Hospital	25	26
☐ Metal work/smelters	27	28
☐ None of these	29	30

8. **Have you been exposed to any of the following during the past week?** *(Check all that apply, and indicate any to which you have been exposed in the last 24 hours.)*

	Past Week	Past 24 Hours
☐ Solvents (e.g., *toluene, acetone, chloroform*)	01	02
☐ Odorous chemicals (e.g., *gasoline, sulfur, mothballs*)	03	04
☐ Toxic or hazardous chemicals (e.g., *pesticides*)	05	06
☐ High dust or particulate levels	07	08
☐ Auto/truck exhausts (heavy or long exposure, i.e., tunnel or expressway)	09	10
☐ Cleaning solutions (including household chemicals)	11	12
☐ Degreasing compounds	13	14
☐ Other *(probe)*	15	16

8. a. Please list the specific name of any chemical or hazardous substance to which you have been exposed.

9. a. For the first time period during which you wore an air pump (Time on ____________, Time off ____________), please indicate your activity which lasted the most time. In addition, please indicate any other activities which lasted for more than one hour.

	Location:		Level of Physical Activity:
Activity	Indoor/ Outdoor	Urban/ Suburban/ Rural	Strenuous/ Light
1. (Longest) ____________	01 02	03 04 05	06 07
2. ____________	08 09	10 11 12	13 14
3. ____________	15 16	17 18 19	20 21
4. ____________	22 23	24 25 26	27 28

b. Please provide the following information for each trip during this time period.

			Traffic:	Ventilation:
Trip	Minutes	Mode of Transport	Heavy/Light	Windows: Open/Closed/ NA
1.	☐☐☐	____________	1 2	1 2 3
2.	☐☐☐	____________	1 2	1 2 3
3.	☐☐☐	____________	1 2	1 2 3
4.	☐☐☐	____________	1 2	1 2 3

c. Please indicate any unusual events which happened during this time period which might have any effect on your exposure to environmental chemicals.

10. a. For the second time period during which you wore an air pump (Time on __________ , Time off __________), please indicate your activity which lasted the most time. In addition, please indicate any other activities which lasted for more than one hour.

	Location:		Level of Physical Activity:
Activity	Indoor/ Outdoor	Urban/ Suburban/ Rural	Strenuous/ Light
1. (Longest) ______________________	01 02	03 04 05	06 07
2. ______________________	08 09	10 11 12	13 14
3. ______________________	15 16	17 18 19	20 21
4. ______________________	22 23	24 25 26	27 28

b. Please provide the following information for each trip during this time period.

			Traffic:	Ventilation:
Trip	Minutes	Mode of Transport	Heavy/Light	Windows: Open/Closed/ NA
1.	☐☐☐	______________________	1 2	1 2 3
2.	☐☐☐	______________________	1 2	1 2 3
3.	☐☐☐	______________________	1 2	1 2 3
4.	☐☐☐	______________________	1 2	1 2 3

c. Please indicate any unusual events which happened during this time period which might have any effect on your exposure to environmental chemicals.

____

____

____

____

____

____

APPENDIX D

RECOVERY OF DEUTERATED VOLATILE ORGANICS FROM SPIKED TENAX GC SAMPLING CARTRIDGES USED IN FIELD SAMPLING

RECOVERY OF BENZENE-d_6, CHLOROBENZENE-d_5, AND ETHYLBENZENE-d_{10} IN FIELD SAMPLES

-Los Angeles, CA, Trip 1-

Medium	N	% Recovery ± S.D. (% RSD)		
		Benzene-d6	Chlorobenzene-d5	Ethylbenzene-d10
Personal Air	10	75 ± 15 (20)	94 ± 19 (20)	105 ± 13 (13)
Breath	4	68 ± 14 (20)	78 ± 17 (22)	78 ± 16 (20)
Fixed-site Air	3	90 ± 2.5 (3)	93 ± 18 (19)	106 ± 12 (11)
Overall	17	73 ± 19 (26)	90 ± 18 (20)	99 ± 17 (17)

RECOVERY OF BENZENE-d_6, CHLOROBENZENE-d_5, AND ETHYLBENZENE-d_{10} IN FIELD SAMPLES

-Los Angeles, CA, Trip 2-

Medium or Instrument	N	% Recovery ± S.D. (% RSD)		
		Benzene-d_6	Chlorobenzene-d_5	Ethylbenzene-d_{10}
Personal Air	27	87 ± 24 (28)	83 ± 16 (20)	83 ± 15 (18)
Breath	9	96 ± 20 (21)	112 ± 29 (26)	125 ± 11 (9)
Fixed-site Air	5	59 ± 8 (14)	66 ± 12 (18)	70 ± 11 (15)
Overall	36	82 ± 24 (29)	89 ± 25 (39)	92 ± 24 (26)
Finnigan 3300	25	82 ± 21 (26)	84 ± 25 (29)	93 ± 27 (29)
Finnigan 4000	11	83 ± 31 (37)	92 ± 16 (17)	89 ± 15 (17)

RECOVERY OF BENZENE-d_6, CHLOROBENZENE-d_5, AND ETHYLBENZENE-d_{10} IN FIELD SAMPLES

-Contra Costa, CA-

Medium or Instrument	N	% Recovery ± S.D. (% RSD)		
		Benzene-d_6	Chlorobenzene-d_5	Ethylbenzene-d_{10}
Personal Air	14	94 ± 10 (11)	92 ± 12 (13)	93 ± 12 (13)
Breath	4	70 ± 4.9 (7)	124 ± 41 (33)	116 ± 29 (25)
Overall	19	91 ± 13 (15)	101 ± 26 (26)	100 ± 20 (20)
Finnigan 3300	7	85 ± 20 (23)	97 ± 6.2 (6)	103 ± 34 (33)
Finnigan 4000	12	94 ± 7.5 (8)	108 ± 43 (40)	99 ± 7 (7)

PERCENT RELATIVE STANDARD DEVIATION FOR DUPLICATE SAMPLE PAIRS

-Los Angeles, CA, Trip 1-

Chemical	N	% RSD	Range
Benzene-d_6	4	12	2-28
Chlorobenzene-d_5	5	11	1-20
Ethylbenzene-d_{10}	5	8	0-19

PERCENT RELATIVE STANDARD DEVIATION FOR DUPLICATE SAMPLE PAIRS

-Los Angeles, CA, Trip 2-

Chemical	N	% RSD	Range
Benzene-d_6	10	15	0-42
Chlorobenzene-d_5	10	14	0-29
Ethylbenzene-d_{10}	10	13	1-31

PERCENT RELATIVE STANDARD DEVIATION FOR DUPLICATE SAMPLE PAIRS*

-Contra Costa, CA-

Chemical	N	% RSD	Range
Benzene-d_6	8	6.8	1-16
Chlorobenzene-d_5	8	7.6	1-22
Ethylbenzene-d_{10}	8	8.4	1-28

*Over all media.

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